APR. 1935

MODERN MECHANIX AND INVENTIONS

April

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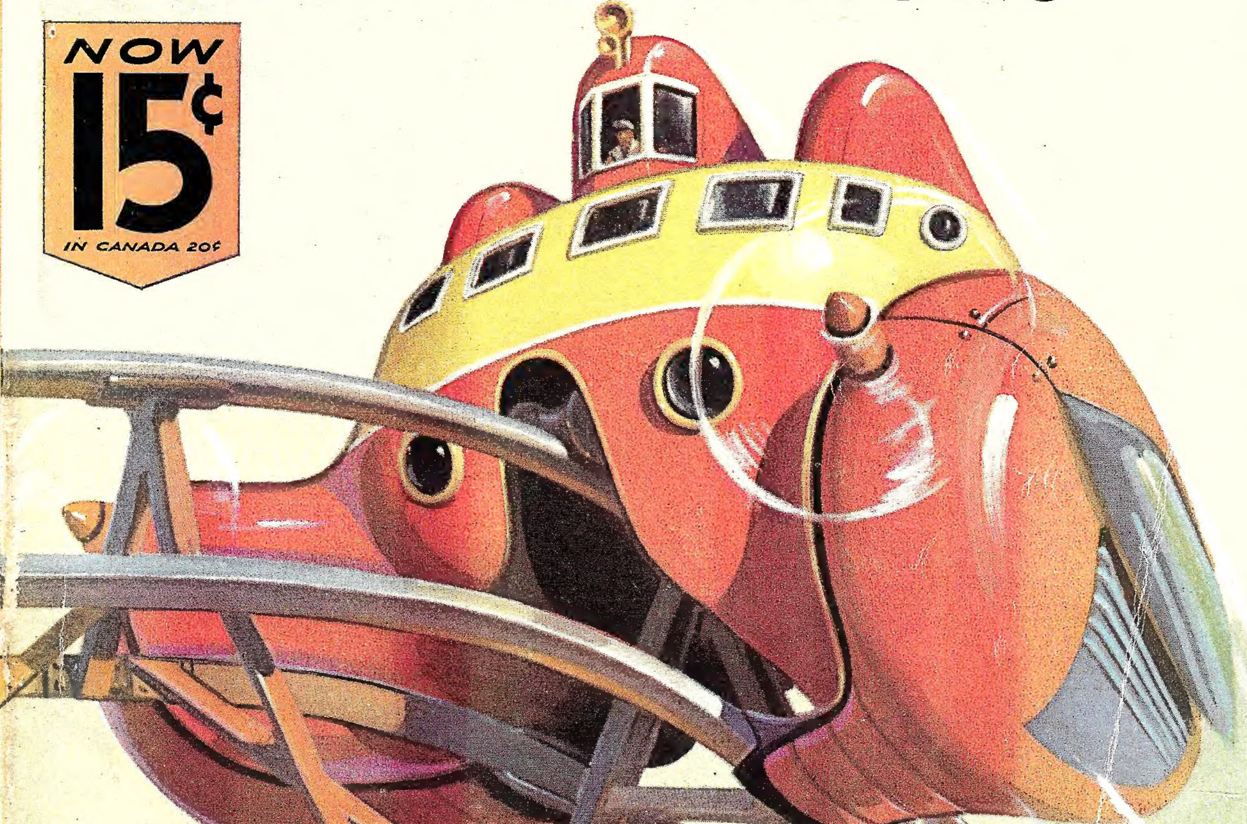

AERO-DRIVE MONORAIL EXPRESS SEE PAGE 85

NRA CODE

MODERN MECHANIX and INVENTIONS

Building Stratosphere Air Liners

By Allan Lockheed • Noted Plane Designer

15 CENTS

A Money-Making Opportunity

for Men of Character

EXCLUSIVE FRANCHISE FOR

AN INVENTION EXPECTED TO REPLACE A MULTI-MILLION-DOLLAR INDUSTRY

Costly Work Formerly "Sent Out" by Business Men Now Done by Themselves at a Fraction of the Expense

This is a call for men everywhere to handle exclusive agency for one of the most unique business inventions of the day.

Forty years ago the horse and buggy business was supreme—today almost extinct. Twenty years ago the phonograph industry ran into many millions—today practically a relic. Only a comparatively few foresighted men saw the fortunes ahead in the automobile and the radio. Yet irresistible waves of public buying swept these men to fortune, and sent the buggy and the phonograph into the discard. So are great successes made by men able to detect the shift in public favor from one industry to another.

Now another change is taking place. An old established industry—an integral and important part of the nation's structure—in which millions of dollars change hands every year—is in thousands of cases being replaced by a truly astonishing, simple invention which does the work better—more reliably—AND AT A COST OFTEN AS LOW AS 2% OF WHAT IS ORDINARILY PAID! It has not required very long for men who have taken over the rights to this valuable invention to do a remarkable business, and show earnings which in these times are almost unheard of for the average man.

EARNINGS

One man in California earned over $1,600 per month for three months—close to $5,000 in 90 days' time. Another writes from Delaware—"Since I have been operating (just a little less than a month of actual selling) and not the full day at that, because I have been getting organized and had to spend at least half the day in the office; counting what I have sold outright and on trial, I have made just a little in excess of one thousand dollars profit for one month." A Georgia man made $802.50 his first two weeks. A Connecticut man writes he has made $55.00 in a single day's time. Texas man nets over $300 in less than a week's time. Space does not permit mentioning here more than these few random cases. However, they are sufficient to indicate that the worthwhile future in this business is coupled with immediate earnings for the right kind of man. One man with us has already made over a thousand sales on which his earnings ran from $5 to $60 per sale and more. A great deal of this business was repeat business. Yet he had never done anything like this before coming with us. That is the kind of opportunity this business offers. The fact that this business has attracted to it such business men as former bankers, executives of businesses—men who demand only the highest type of opportunity and income—gives a fairly good picture of the kind of business this is. Our door is open, however, to the young man looking for the right field in which to make his start and develop his future.

Not a "Gadget"— Not a "Knick-Knack"—

but a valuable, proved device which has been sold successfully by business novices as well as seasoned veterans.

Make no mistake—this is no novelty—no flimsy creation which the inventor hopes to put on the market. You probably have seen nothing like it yet—perhaps never dreamed of the existence of such a device—yet it has already been used by corporations of outstanding prominence—by dealers of great corporations—by their branches—by doctors, newspapers, publishers—schools—hospitals, etc., etc., and by thousands of small business men. You don't have to convince a man that he should use an electric bulb to light his office instead of a gas lamp. Nor do you have to sell the same business man the idea that some day he may need something like this invention. The need is already there—the money is usually being spent right at that very moment—and the desirability of saving the greatest part of this expense is obvious immediately.

Some of the Savings You Can Show

You walk into an office and put down before your prospect a letter from a sales organization showing that they did work in their own office for $11 which formerly could have cost them over $200. A building supply corporation pays our man $70, whereas the bill could have been for $1,600! An automobile dealer pays our representative $15, whereas the expense could have been over $1,000. A department store has expense of $88.60, possible cost if done outside the business being well over $2,000. And so on. We could not possibly list all cases here. These are just a few of the many actual cases which we place in your hands to work with. Practically every line of business and every section of the country is represented by these field reports which hammer across dazzling, convincing money-saving opportunities which hardly any business man can fail to understand.

Profits Typical of the Young, Growing Industry

Going into this business is not like selling something offered in every grocery, drug or department store. For instance, when you take a $7.50 order, as much as $5.83 may be your share. On $1,500 worth of business, your share may be $1,167.00. The very least you get as your part of every dollar's worth of business you do is 67 cents—on ten dollar's worth $6.70, on a hundred dollars' worth $67.00—in other words two thirds of every order you get is yours. Not only on the first order—but on repeat orders—and you have the opportunity of earning an even larger percentage.

This Business Has Nothing to Do With House to House Canvassing

Nor do you have to know anything about high-pressure selling. "Selling" is unnecessary in the ordinary sense of the word. Instead of hammering away at the customer and trying to "force" a sale, you make a dignified, business-like call, leave the installation—whatever size the customer says he will accept—at our risk, let the customer sell himself after the device is in and working. This does away with the need for pressure on the customer—it eliminates the handicap of trying to get the money before the customer has really convinced himself 100%. You simply tell what you offer, showing proof of success in that customer's particular line of business. Then leave the invention without a dollar down. It starts working at once. In a few short days, the installation has actually produced enough cash money to pay for the deal, with profits above the investment coming in at the same time. You then call back, collect your money. Nothing is so convincing as our offer to let results speak for themselves without risk to the customer! While others fail to get even a hearing, our men are making sales running into the hundreds. They have received the attention of the largest firms in the country, and sold to the smallest businesses by the thousands.

No Money Need Be Risked

in trying this business out. You can measure the possibilities and not be out a dollar. *If you are looking for a business that is not overcrowded*—a business that is just coming into its own—on the upgrade, instead of the downgrade—a business that offers the buyer relief from a burdensome, but unavoidable expense—a business that has a prospect practically in every office, store, or factory into which you can set foot—regardless of size—*that is a necessity* but does not have any price cutting to contend with as other necessities do—that because you control the sales in exclusive territory is your own business—*that pays more on some individual sales than many men make in a week and sometimes in a month's time*—if such a business looks as if it is worth investigating, *get in touch with us at once* for the rights in your territory—don't delay—because the chances are that if you do wait, someone else will have written to us in the meantime—and if it turns out that you were the better man—we'd both be sorry. So for convenience, *use the coupon below*—but send it right away—or wire if you wish. But do it now. *Address*

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RUSH FOR EXCLUSIVE TERRITORY PROPOSITION

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Without obligation to me, send me full information on your proposition.

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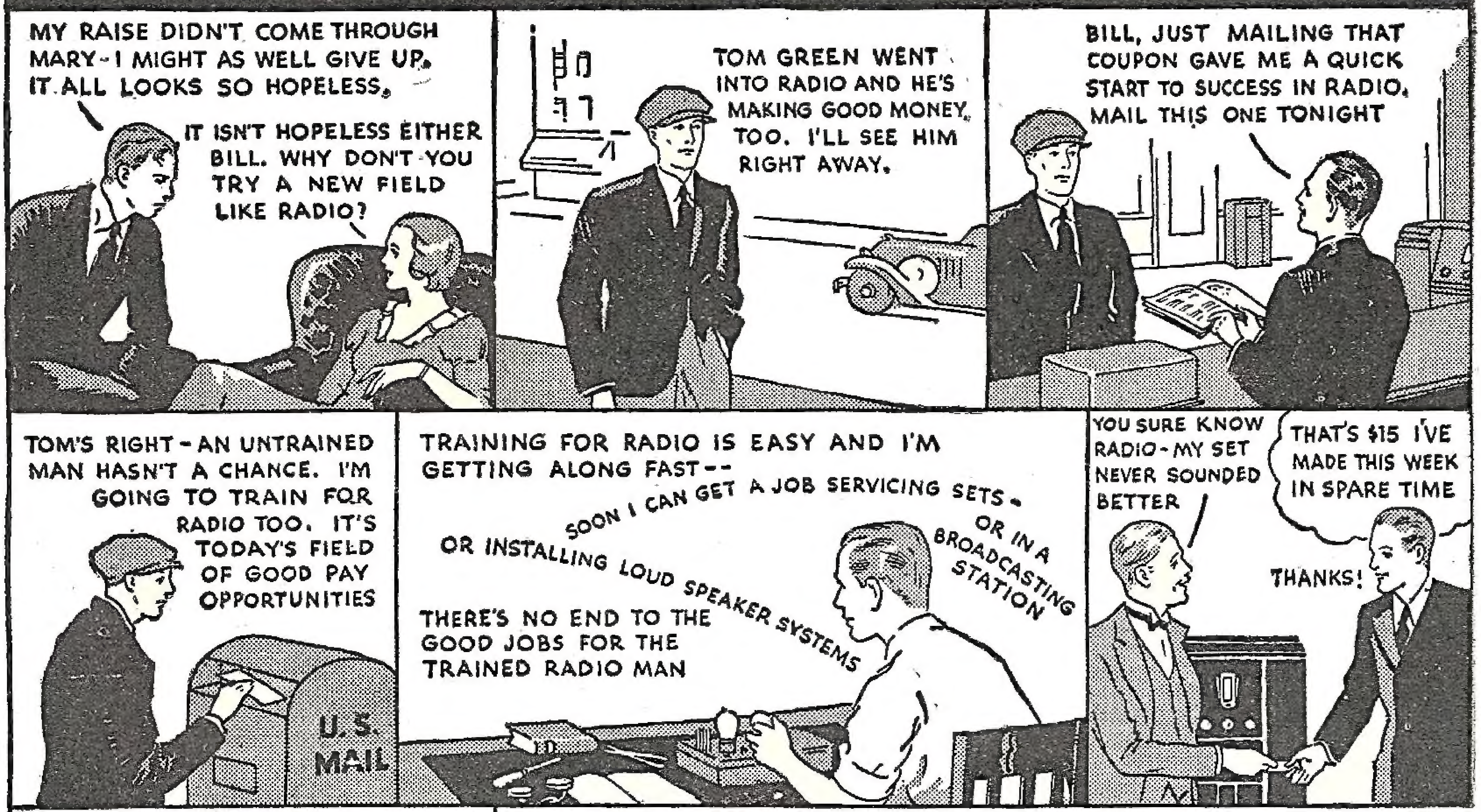
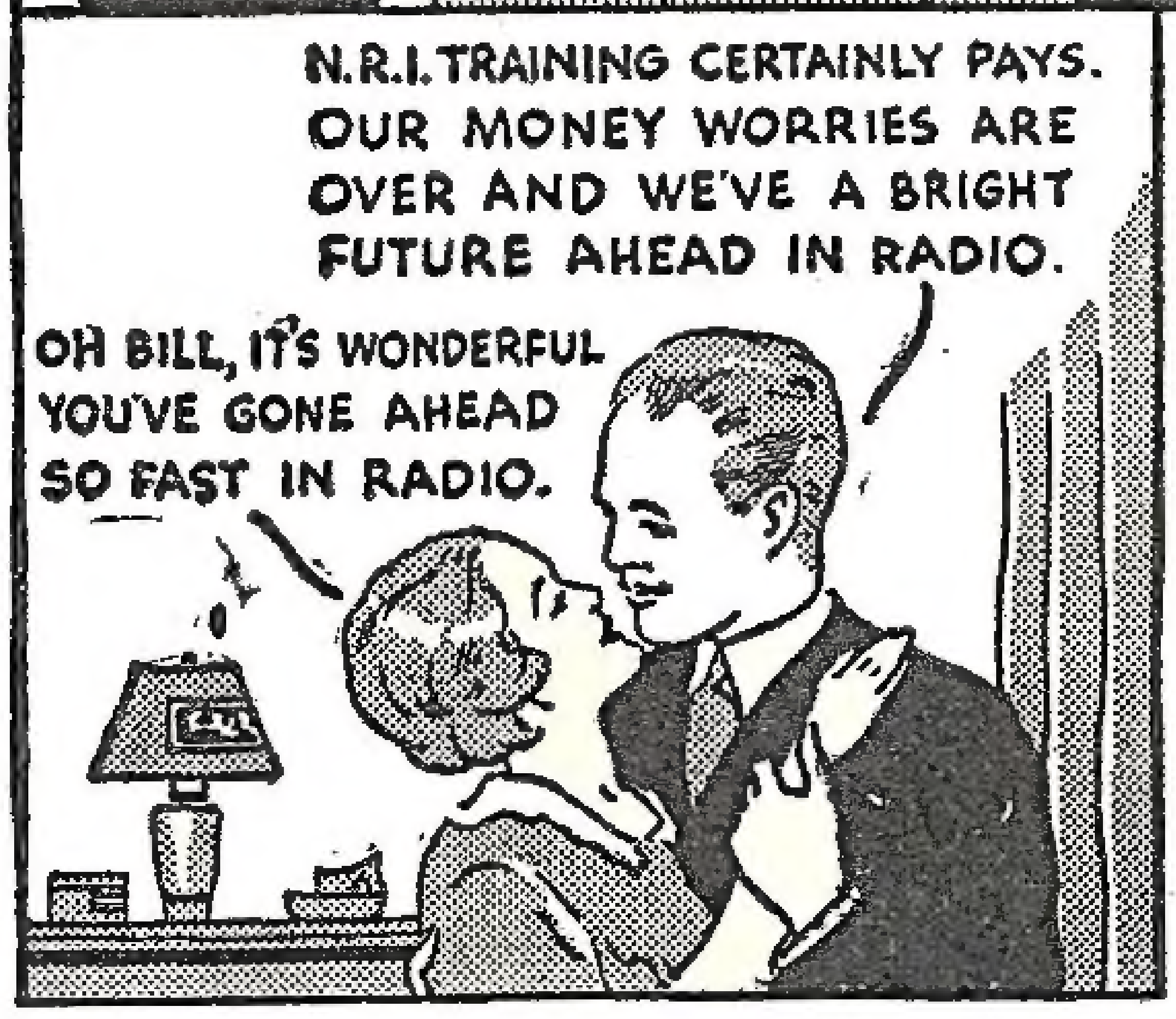
Street or Route...
Box No...
City..
State..

HE THOUGHT HE WAS LICKED—THEN A TIP GOT BILL A GOOD JOB!


MY RAISE DIDN'T COME THROUGH MARY—I MIGHT AS WELL GIVE UP. IT ALL LOOKS SO HOPELESS.
IT ISN'T HOPELESS EITHER BILL. WHY DON'T YOU TRY A NEW FIELD LIKE RADIO?
TOM GREEN WENT INTO RADIO AND HE'S MAKING GOOD MONEY, TOO. I'LL SEE HIM RIGHT AWAY.
BILL, JUST MAILING THAT COUPON GAVE ME A QUICK START TO SUCCESS IN RADIO. MAIL THIS ONE TONIGHT
TOM'S RIGHT—AN UNTRAINED MAN HASN'T A CHANCE. I'M GOING TO TRAIN FOR RADIO TOO. IT'S TODAY'S FIELD OF GOOD PAY OPPORTUNITIES
U.S. MAIL
TRAINING FOR RADIO IS EASY AND I'M GETTING ALONG FAST--
SOON I CAN GET A JOB SERVICING SETS—OR IN A BROADCASTING STATION
OR INSTALLING LOUD SPEAKER SYSTEMS
THERE'S NO END TO THE GOOD JOBS FOR THE TRAINED RADIO MAN
YOU SURE KNOW RADIO—MY SET NEVER SOUNDED BETTER
THAT'S $15 I'VE MADE THIS WEEK IN SPARE TIME
THANKS!


N.R.I. TRAINING CERTAINLY PAYS. OUR MONEY WORRIES ARE OVER AND WE'VE A BRIGHT FUTURE AHEAD IN RADIO.
OH BILL, IT'S WONDERFUL YOU'VE GONE AHEAD SO FAST IN RADIO.

I'LL TRAIN YOU AT HOME
In Your Spare Time For A GOOD RADIO JOB

J. E. SMITH, President
National Radio Institute

The man who has directed the Home-Study Training of more men for the Radio industry than anyother man in America.

Mail the coupon now. Get the facts about Radio—the field with a future. N. R. I. training fits you for jobs in connection with the manufacture, sale and operation of Radio equipment. It fits you to go in business for yourself, service sets, operate on board ships, in broadcasting, television, aviation, police Radio and many other jobs. My FREE book tells how you quickly learn at home in spare time to be a Radio Expert.

Many Radio Experts Make $40, $60, $75 a Week

Why struggle along in a dull job with low pay and no future? Start training now for the live-wire Radio field. I have doubled and tripled salaries. Hundreds of successful men now in Radio got their start through N. R. I. training.

Many Make $5, $10, $15 a Week Extra in Spare Time While Learning

Hold your job. I'll not only train you in a few hours of your spare time a week, but the day you enroll I start sending you Extra Money Job Sheets which quickly show you how to do Radio repair jobs common in most every neighborhood. I give you Radio Equipment for conducting experiments and making tests that teach you to build and service practically every type of receiving set made. Cleo T. Retter, 30 W. Beechwood Ave., Dayton, Ohio, wrote: "Working only in spare time, I made about $1,500 while taking the Course."

Find Out What Radio Offers. Mail Coupon

My book has shown hundreds of fellows how to make more money and win success. It's FREE to any ambitious fellow over 15 years of age. Investigate. Find out what Radio offers you. Read what my Employment Department does to help you get into Radio after graduation, about my Money Back Agreement, and the many other N. R. I. features. Mail the coupon in an envelope, or paste it on a 1c. postcard TODAY.

J. E. SMITH, President, Dept. 5DH
National Radio Institute, Washington, D. C.

Rich Rewards in Radio

HERE'S PROOF that my training pays

Now Owns Own Business
"If I had not taken your Course I would be digging ditches instead of running my own business. One week I made $75 on repairing alone, and this doesn't count sales. If a fellow wants to get into Radio, N. R. I. is the starting point." R. S. Lewis, Modern Radio Service, Pittsfield, Ill.

Spare Time Jobs Earn $15 a Week
"I have no trouble getting Radio work. I have the reputation of being the best Radio man in town, and average $15 to $20 a week for spare time only." G. Bernard Croy, 151 Washington St., Bronson, Michigan.

Owes His Success to Radio Training
"Since 1929 I have earned my living in Radio. I owe my last three jobs to N. R. I. I am now in the main control room of one of the large broadcasting chains." Serge A. De Somov, 1516 Library Ave., New York City.

MAIL THIS NOW

J. E. SMITH, President, Dept. 5DH
National Radio Institute, Washington, D. C.

Dear Mr. Smith: Without obligating me, send your book which points out the spare time and full time job opportunities in Radio and your 50-50 method of training men at home in spare time to become Radio Experts.

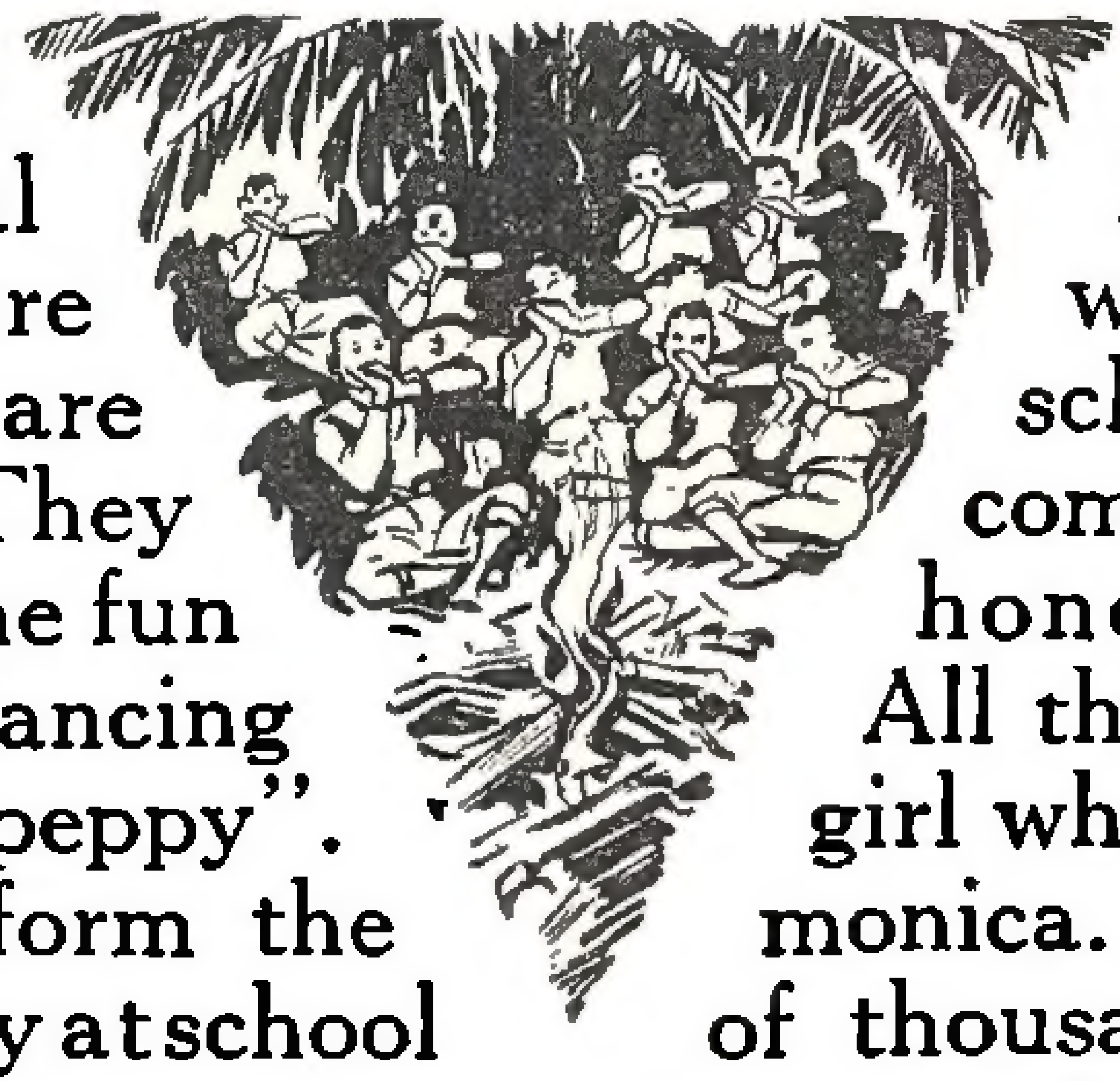
(Please print plainly)

NAME ....AGE ....

ADDRESS ....

CITY ....STATE ....

There's so many good times FOR THE EXPERT HARMONICA PLAYER



● Always in demand for parties, outings and social meetings of every kind are the boys and girls who are good harmonica players. They are the leaders who get the fun going—the singing and dancing that makes the affair "peppy". They are the ones who form the Harmonica Bands that play at school functions, at community meetings, at Scout rallys. And then once or twice a year comes the big Harmonica Band Contest when bands from different schools and communities compete for the trophies and honors that are offered. All this is open to the boy and girl who learns to play the Harmonica. We have helped hundreds of thousands of boys and girls to learn to play this simple and delightful instrument. Let us help you.

At Parties and Dances . . . gay good times

The Harmonica Band makes a big hit

Frequent opportunities to play on the radio

So Simple to Learn

Without costing you a cent you can learn to play the Harmonica like a professional in a short time. Mail the coupon below for free Illustrated Instruction Book, "The Art of Playing the Harmonica." You don't have to know one note from another. This book tells and shows you just what to do. Just follow the simple instructions and in a short time you'll be amazing your friends with the way you can perform.

Be Sure of Your Harmonica

The Harmonica is a real musical instrument, delicately tuned and beautifully made. Don't waste your money on an inferior, poorly made instrument. With a Hohner you know you have the best that can be obtained, the Harmonica that for seventy-five years has been the choice of professional players for their stage and radio work.

LOOK FOR THE HOHNER NAME ON THE HARMONICA. IF IT'S NOT THERE—IT'S NOT A HOHNER. ACCEPT NO SUBSTITUTE.

Send for FREE Instruction Book
See How Easy It Is to Play

HOHNER IS ON THE AIR:

Listen to Carl Freed and his Harmonica Harlequins every Saturday evening on the following stations:

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WGN Chicago at 6:45 P. M.—C. S. T.

You'll enjoy listening to this superb Harmonica Band

We want every boy and girl to know how quickly and easily they can learn to play a Hohner Harmonica. So we would like to send you, absolutely free and without any obligation to you, our complete Instruction Book, "The Art of Playing the Harmonica." Just fill in and mail the coupon, and it will be sent you at once.

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MODERN MECHANIX AND INVENTIONS

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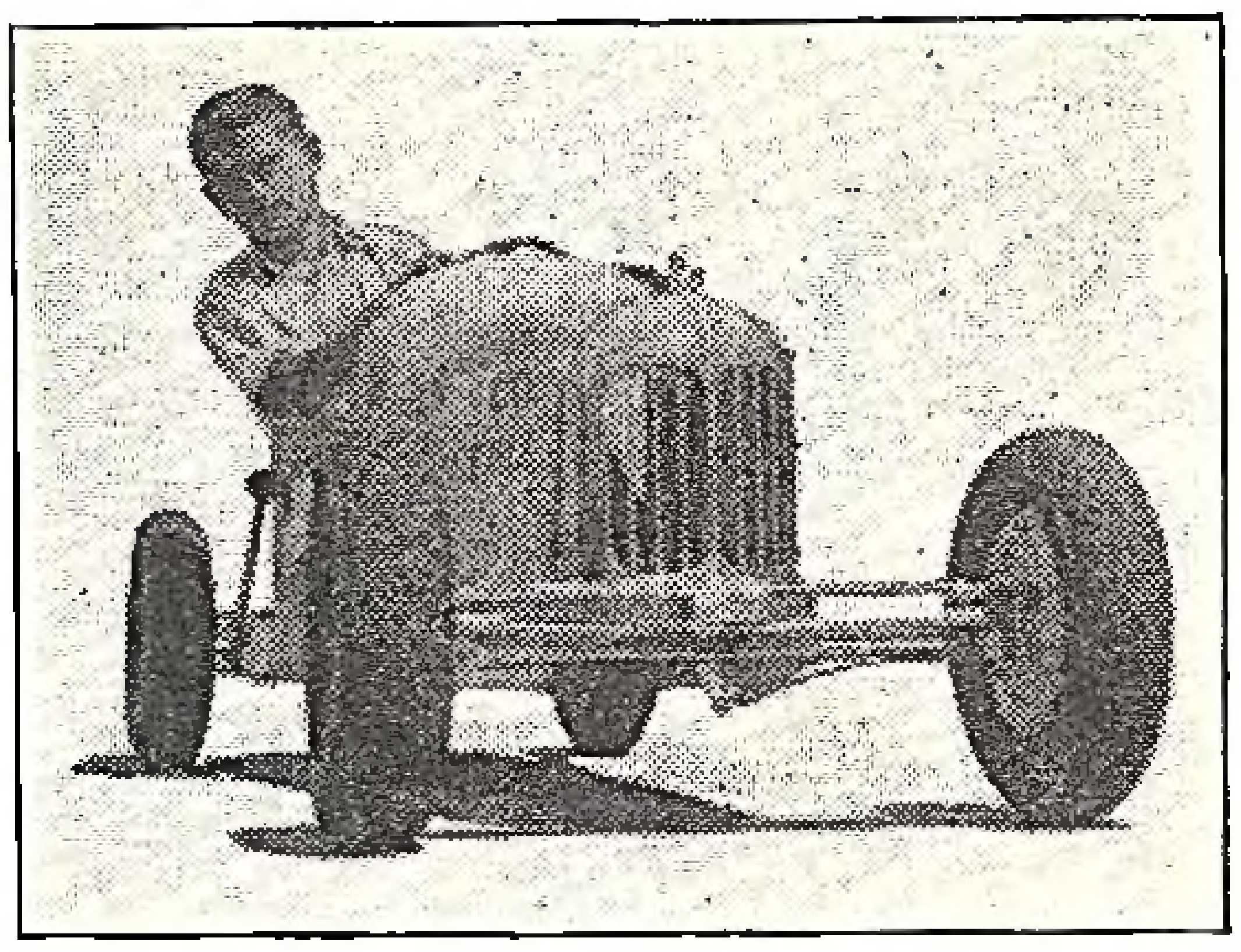
Build a Midget Racer



Built as a scale model of the famous Miller Dirt Track Special, the midget racer described in this issue will attain a speed of 20 miles per hour.

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EMPRESS SHOTOKU
779 A.D.
ORDERS 1,000,000 BUDDHIST CHARMS

An Oilstone

would have sold for its weight in gold

Ages ago, Empress Shotoku tried to drive the evil spirits out of Japan. She ordered wood carvers to engrave enough wooden blocks to print 1,000,000 charms. Each block contained 74 intricate characters. How many blocks were ruined by *evil spirits* in dull knives history does not say.

The *oilstone* quarries of Norton-Pike were first used 1044 years later. Electric furnace *oilstones* were first known in the latter part of the 19th century. Modern industry uses them to take the evil spirits out of cutting tools.

For hand-work and machine work, steel edges are made keener, harder and longer-lasting by *oilstoning.* Go to your hardware store and see the various Norton-Pike *oilstones,* fast-cutting, medium and extra hard.

The expert's skilful technique of sharpening blades, bits, augers, drills, etc., is clearly described and pictured in our free booklet, "How to Sharpen". Send for it today—before you forget!

NORTON *Established 1823*

Use what Experts use **PIKE** *Products*

BEHR-MANNING CORP., *U. S. Sales Representatives*
Dept. K, Troy, N. Y.

Send me free, Norton Pike Book, "How to Sharpen."

Name..

Address..

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Time 10:30 P.M.

Place: An American industrial plant.
Characters: (1) President of the Company.
(2) An employee of the Company.

President: *What are you doing here at this hour of night? No one has authorized overtime.*

Employee: *I'm working on my own time, sir. There's a tough job coming up tomorrow and I want to be ready to handle it. I hope you don't mind.*

IF THIS SCENE HAD HAPPENED IN YOUR PLANT, MR. PRESIDENT, WOULD YOU EVER FORGET THAT MAN?

Listen: This very night, at 10:30 p. m. and later, *that* man (multiplied by many thousands) will be working *on his own time* so he may do a better job for his employer tomorrow. Of course he expects to benefit ultimately because of it—isn't this the fundamental principle of individual progress in American industry? But the point is, he is making an investment in himself that must pay dividends to his employers before there is any change in his own pay envelope.

There you have the philosophy of the average student of the International Correspondence Schools.

The I. C. S. student believes the best way to get a better job is to do his present job better. And ambitious men who accept this theory of personal progress are invited to consider the coupon below, mark the subject of their chosen careers and to mail it today.

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☐ Electric Lighting
☐ Welding, Electric and Gas
☐ Reading Shop Blueprints
☐ Telegraph Engineer
☐ Telephone Work
☐ Mechanical Engineer
☐ Mechanical Draftsman
☐ Machinist ☐ Toolmaker
☐ Patternmaker
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☐ Aviation Engines
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☐ Plumbing ☐ Steam Fitting
☐ Heating ☐ Ventilation
☐ Sheet Metal Worker
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LEPAGE'S
LIQUID GLUE

IN the strict sense of the word, a can of LePage's Glue is not a tool; but when a craftsman writes: "It's the handiest tool in my workshop," it must be part of the tool kit.

Yes, it must be important because the craftsman or hobbyist who has spent money for lumber in making a project isn't taking any chances on a questionable glue. He wants strength and usually a slow setting glue to adjust joints. He likes to complete his work without unnecessary stops such as "messing" around with glue pots. That's why the amateur as well as the top-notcher prefers the ready-to-use LePage's.

Keep it in mind next time you visit your hardware store.

RUSSIA CEMENT CO.
Laboratory and Factory • Gloucester, Mass.

LEPAGE'S GLUE

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Are the Type of Pilots and Mechanics Demanded in

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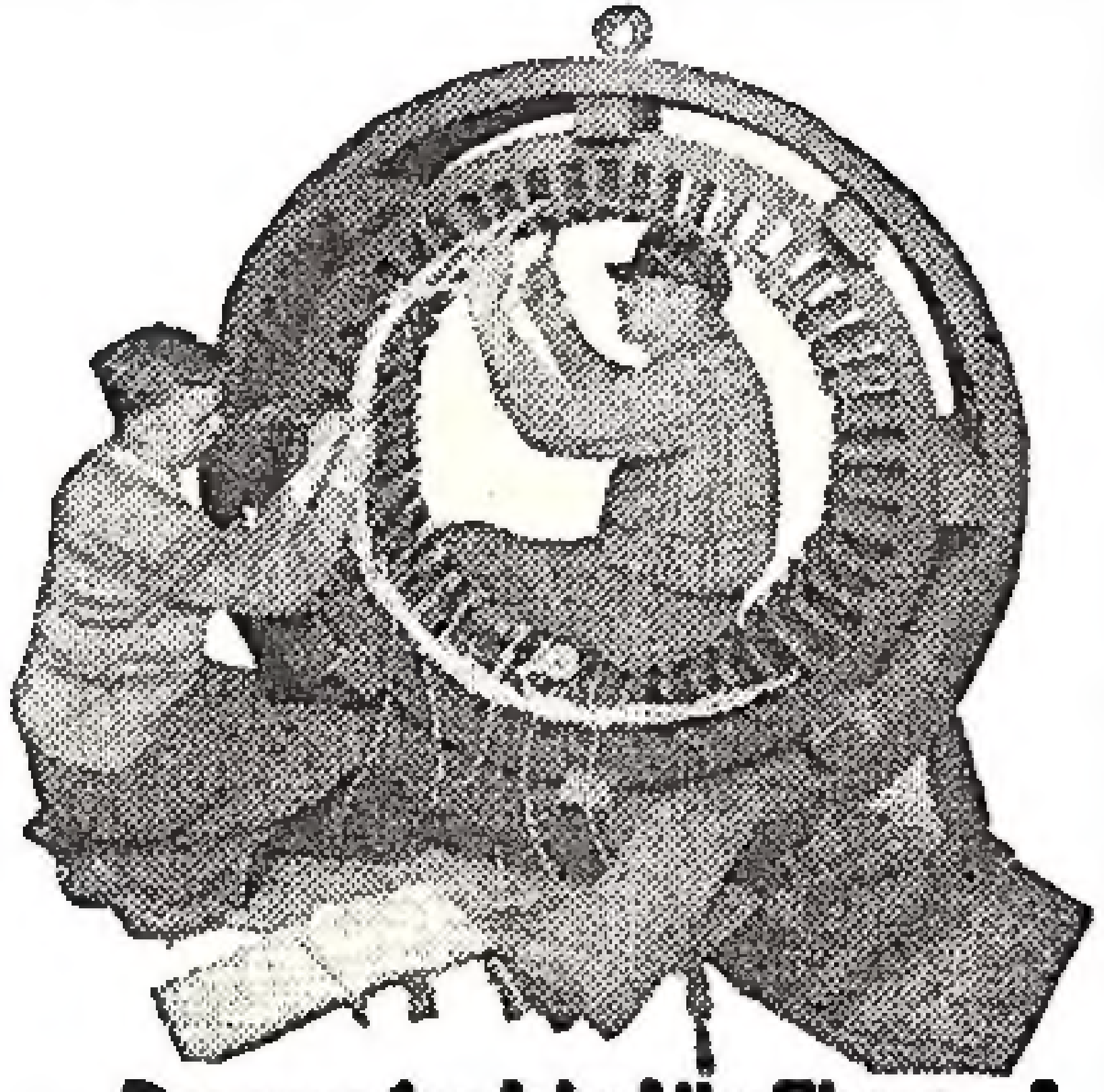

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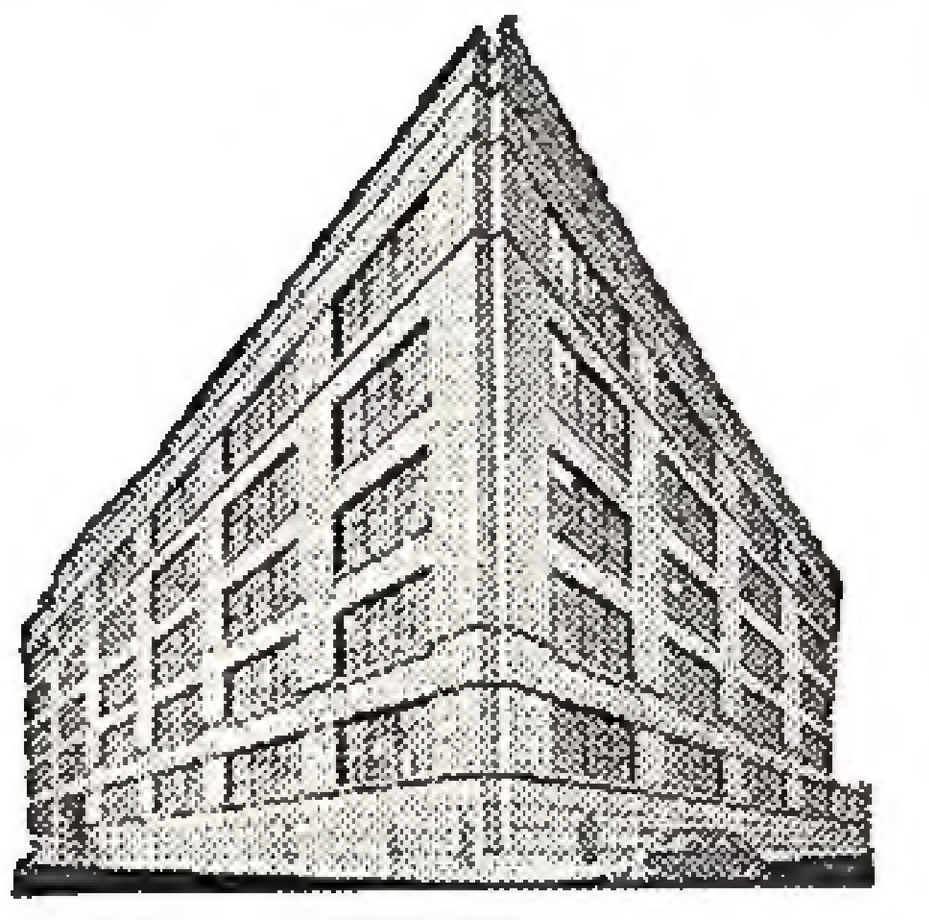

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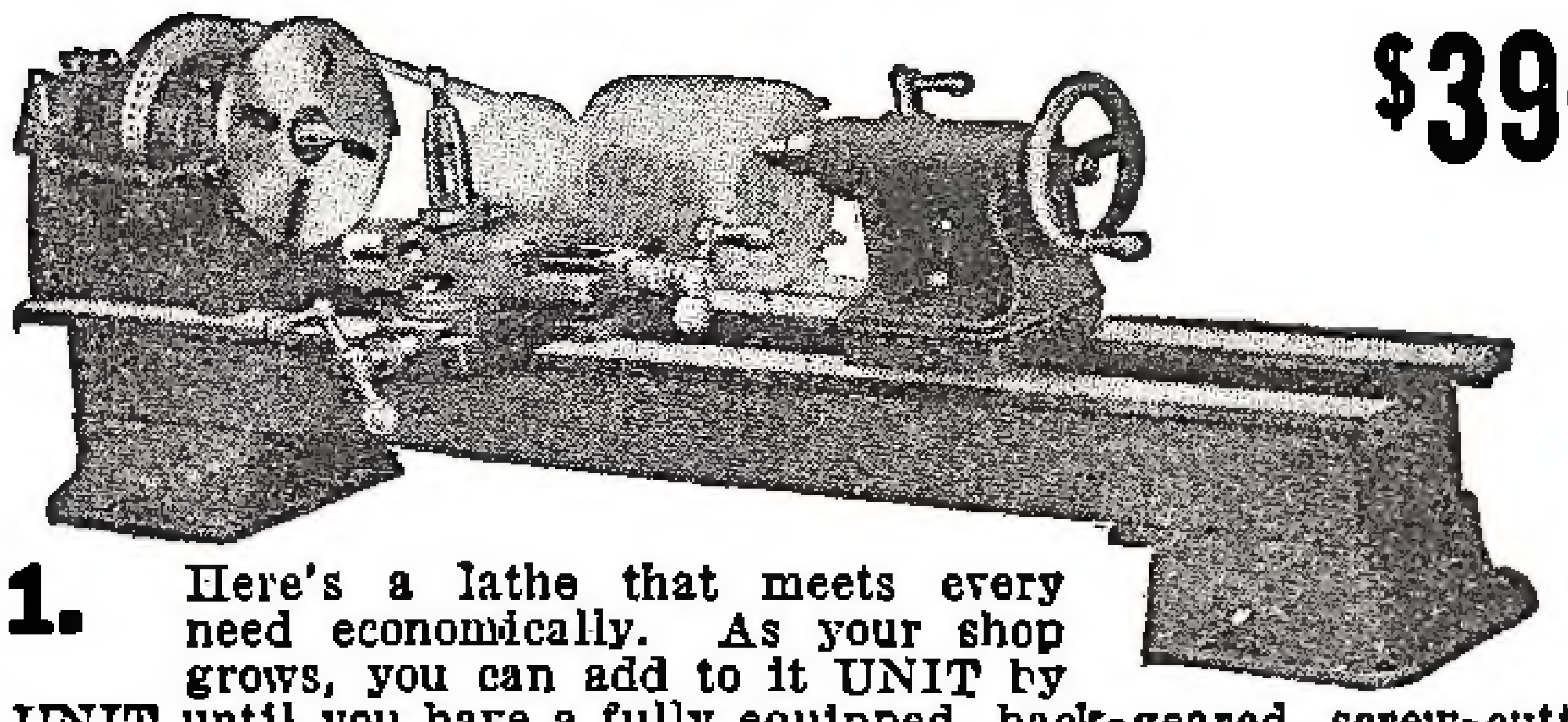

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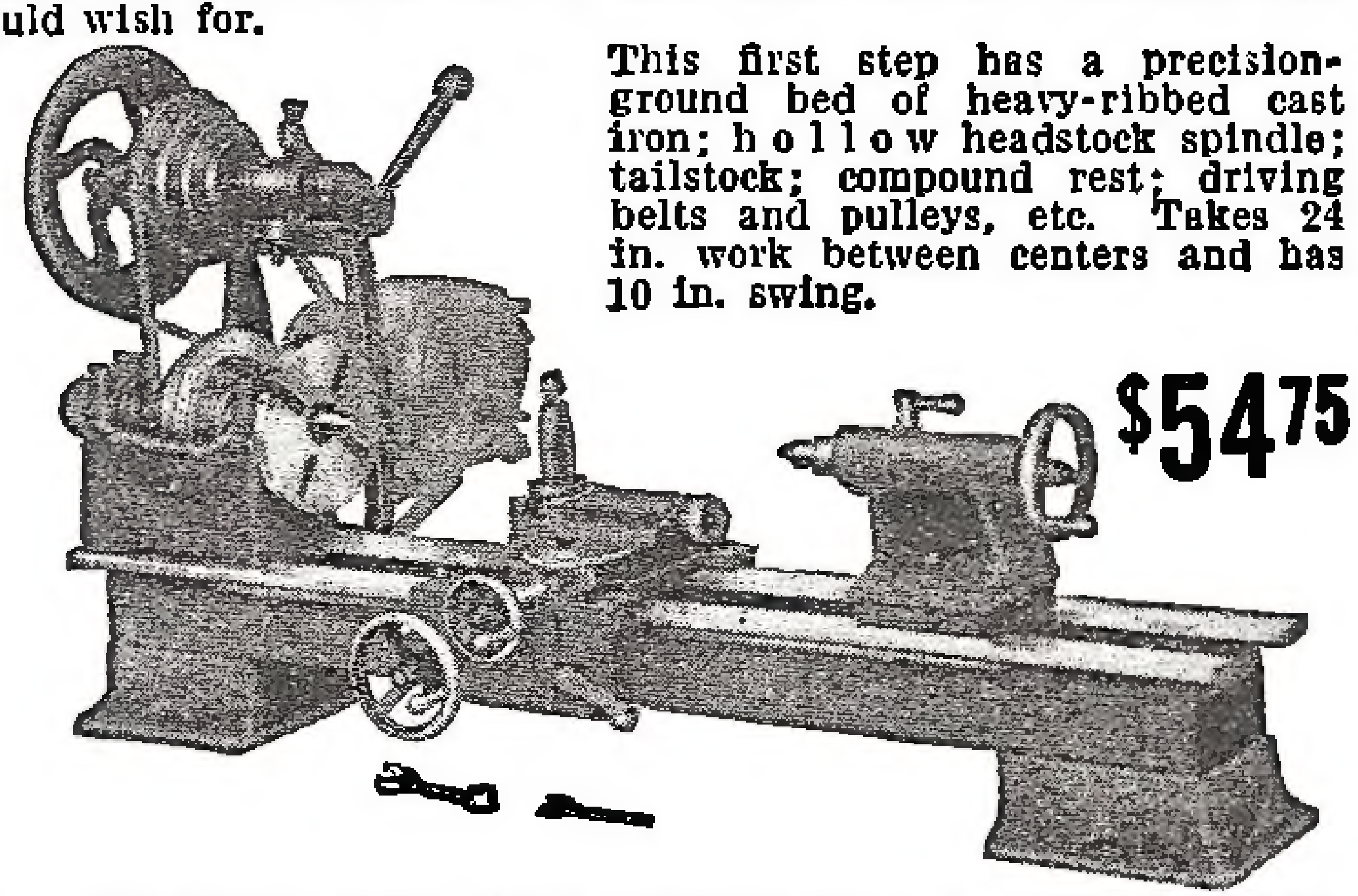

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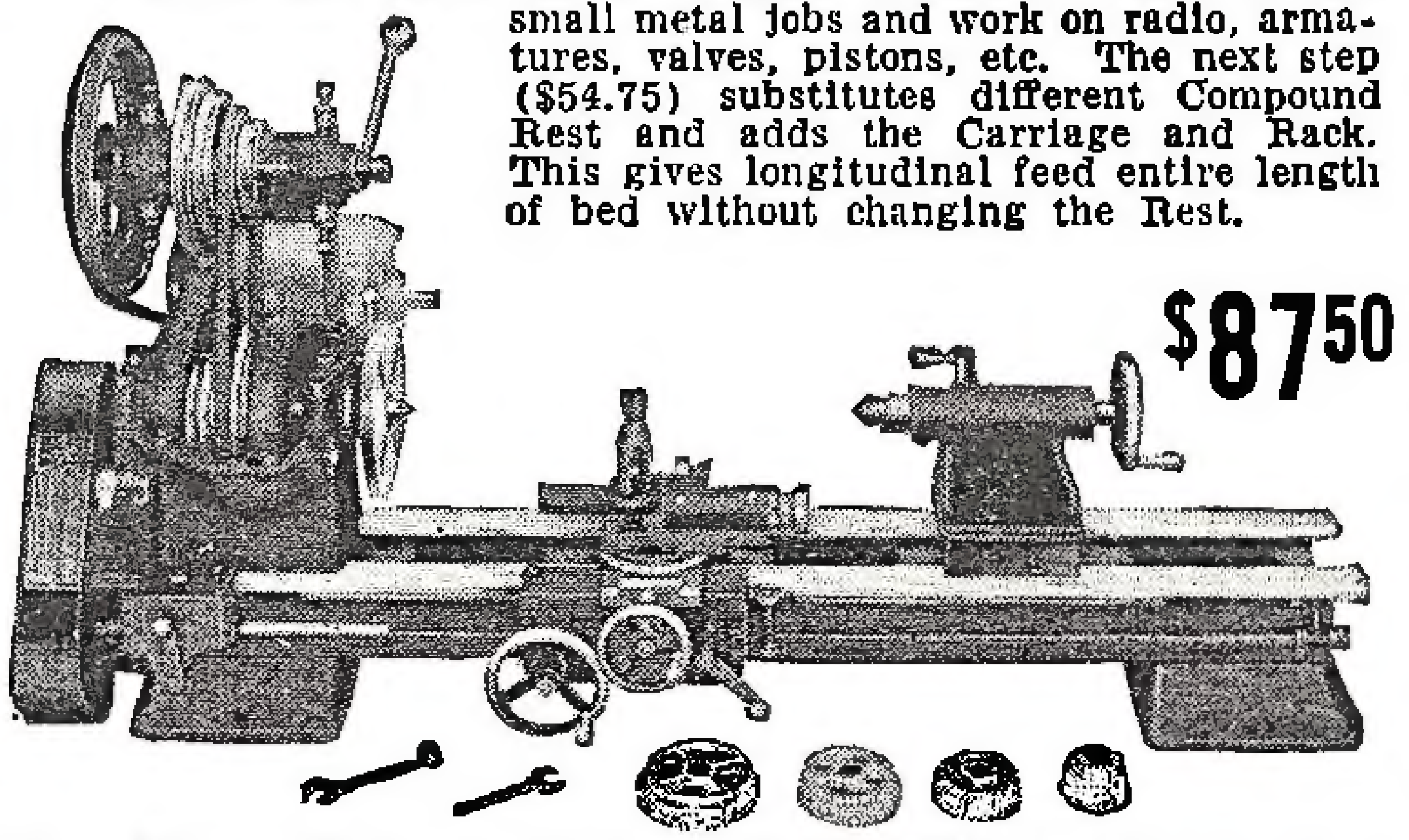

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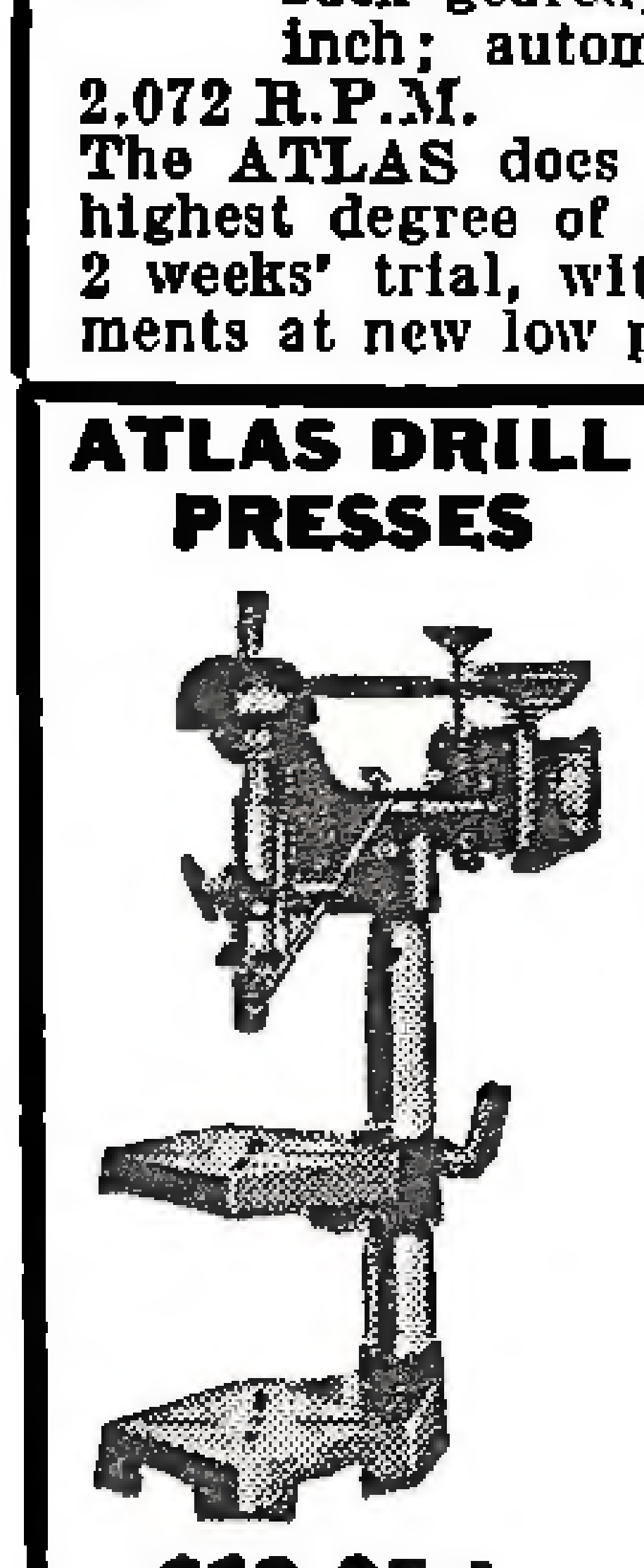

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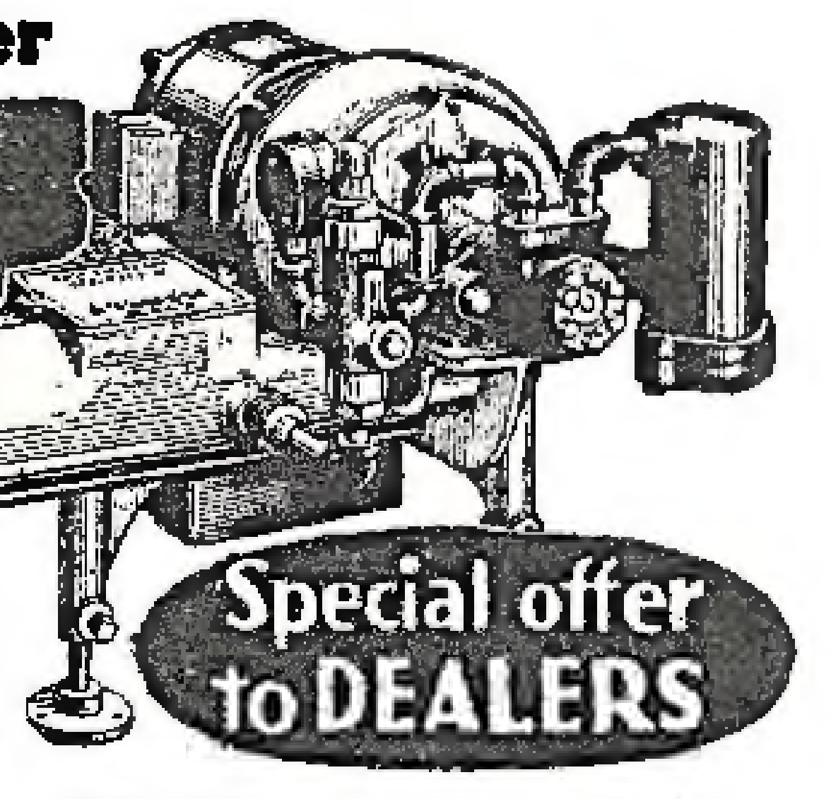

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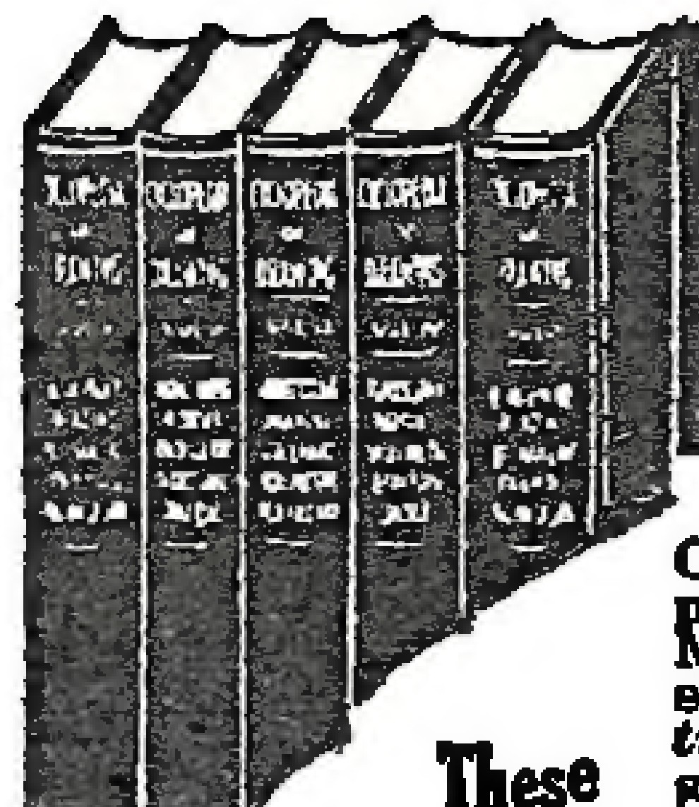

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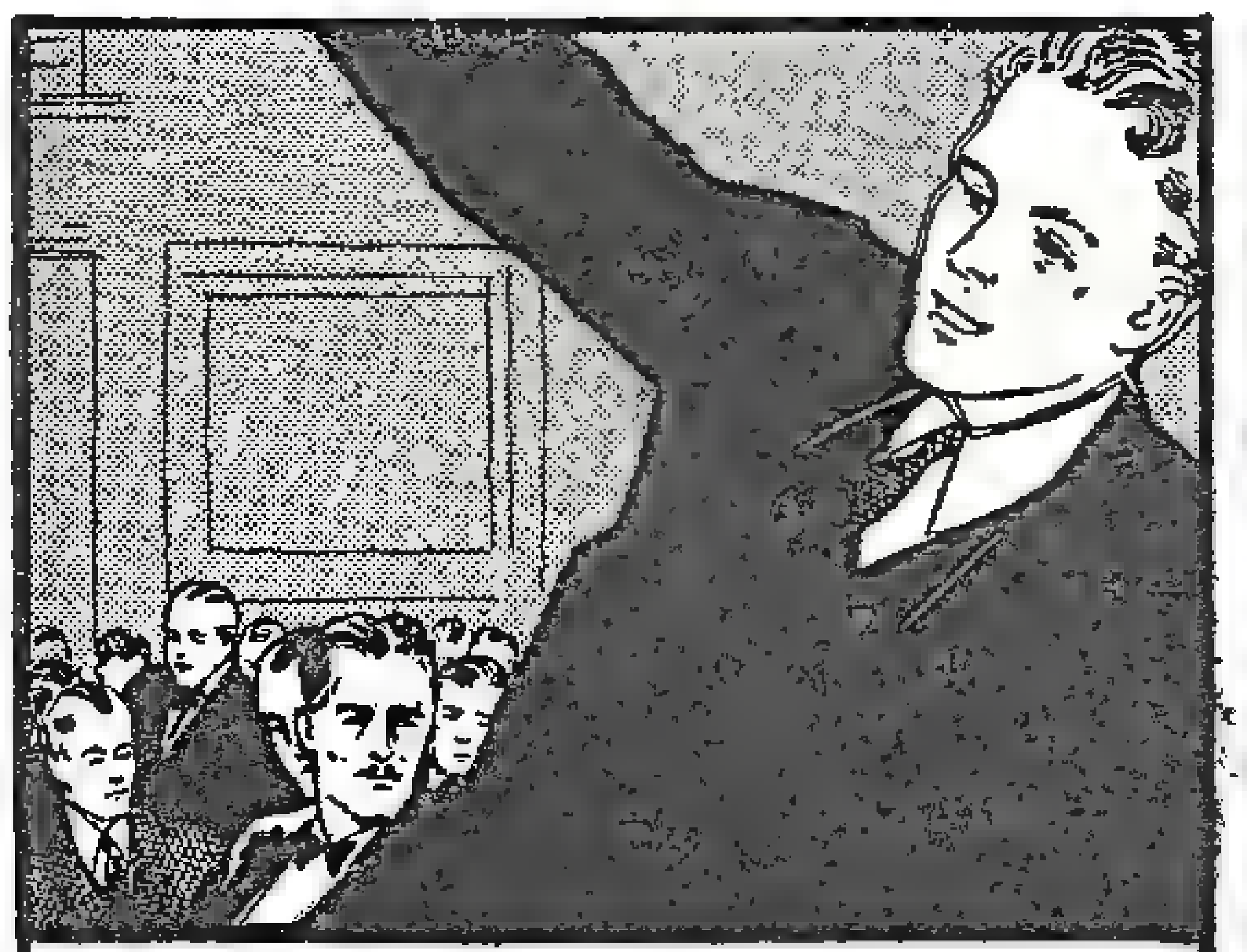

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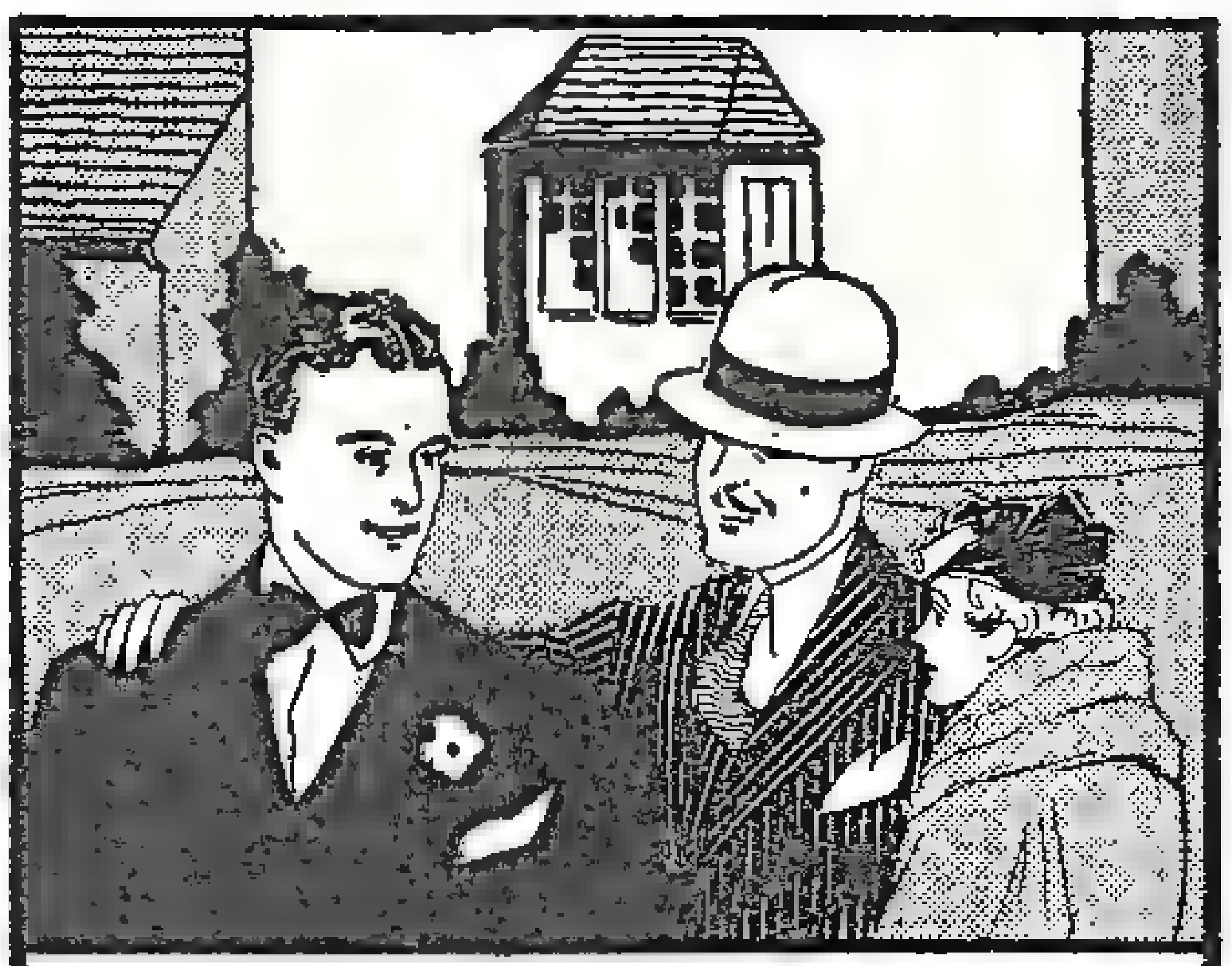

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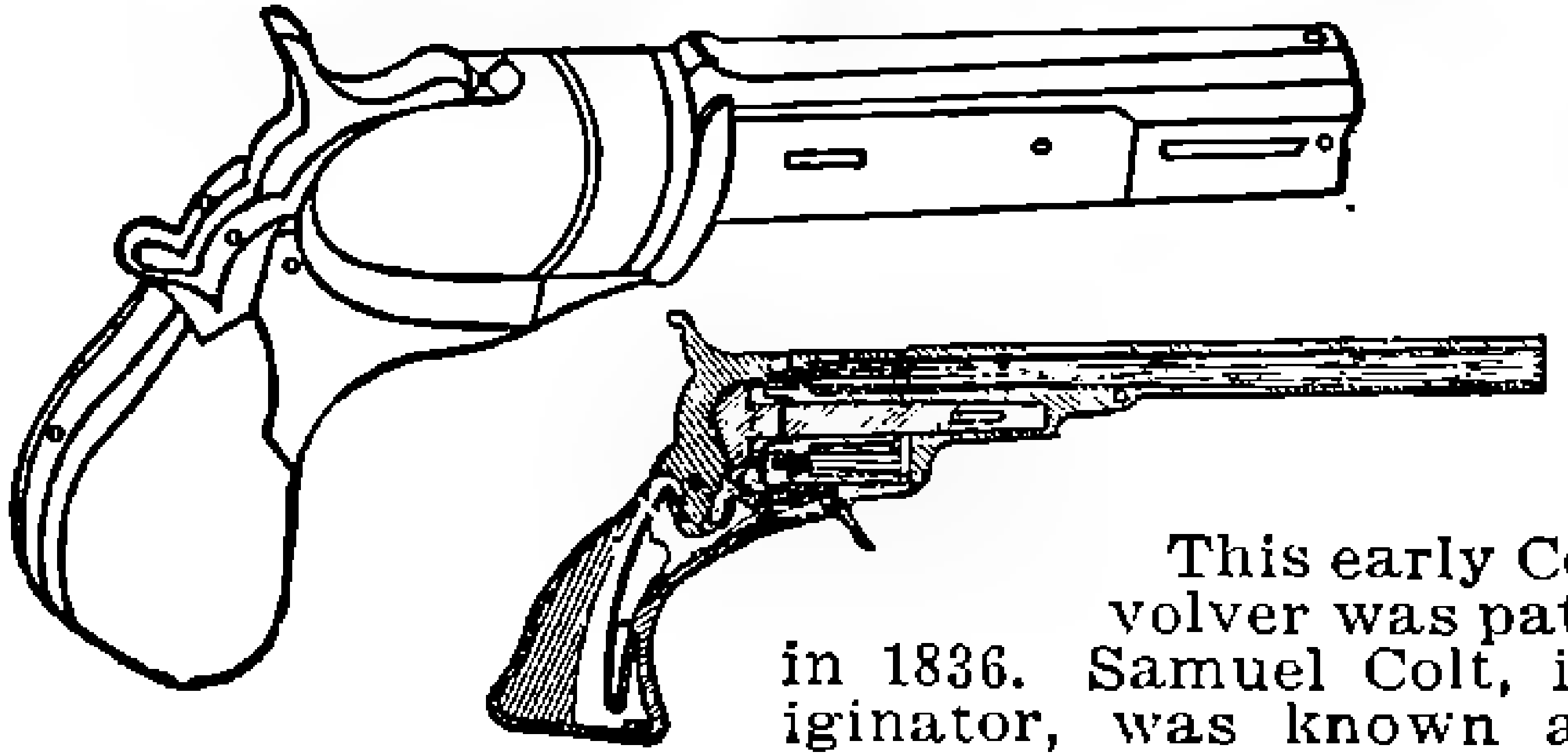
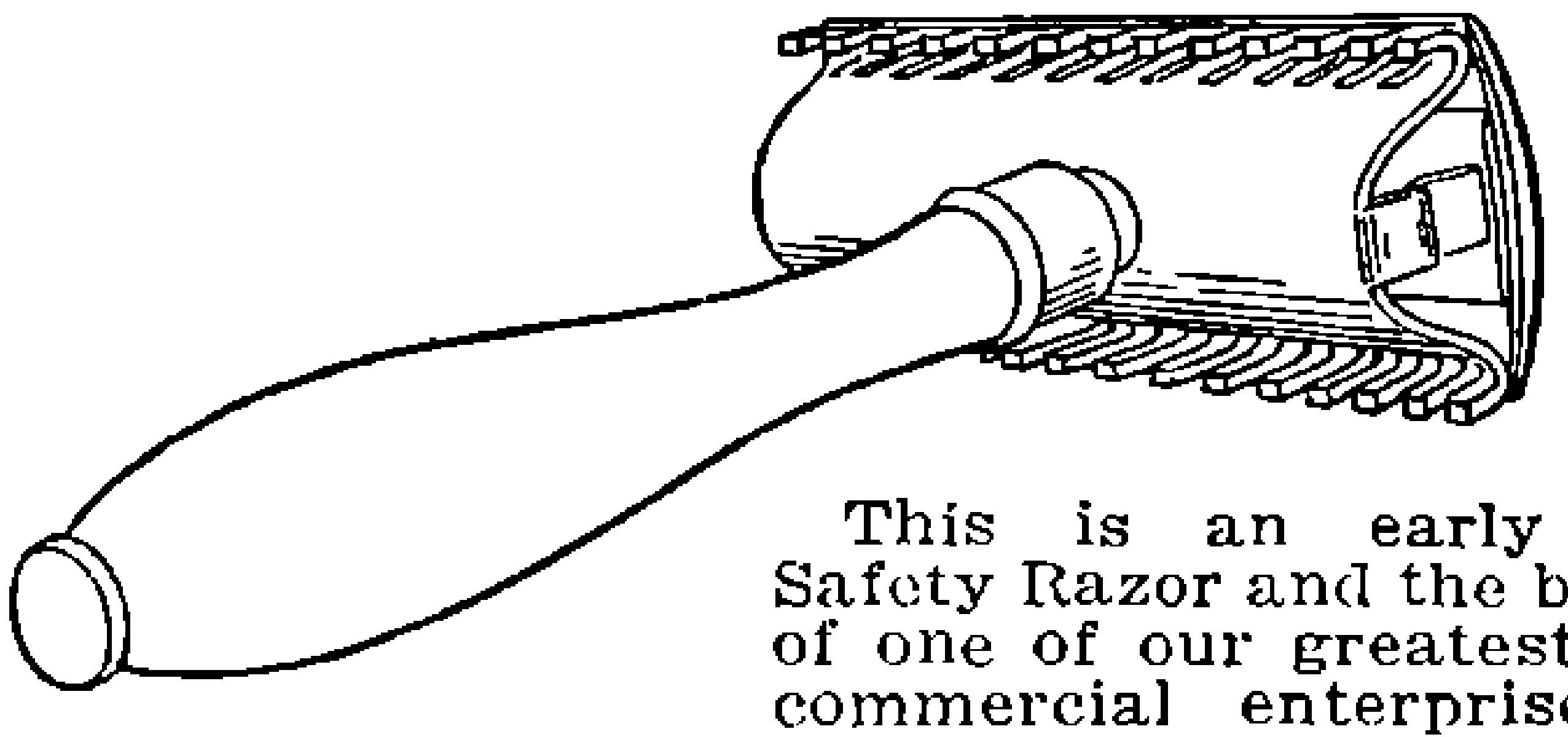


This early Colt revolver was patented in 1836. Samuel Colt, its originator, was known as the boy inventor. While still a lad he ran away to sea and whittled the first model of a repeating fire-arm out of wood during his leisure moments on shipboard. Colt is a good example of the inventor who was persevering. Three years later, in 1839, he had made improvements to produce the second revolver shown here. It was used in the Mexican War with excellent effect. By 1852, Colt had the largest firearms factory in the world. Colt died a very wealthy man.



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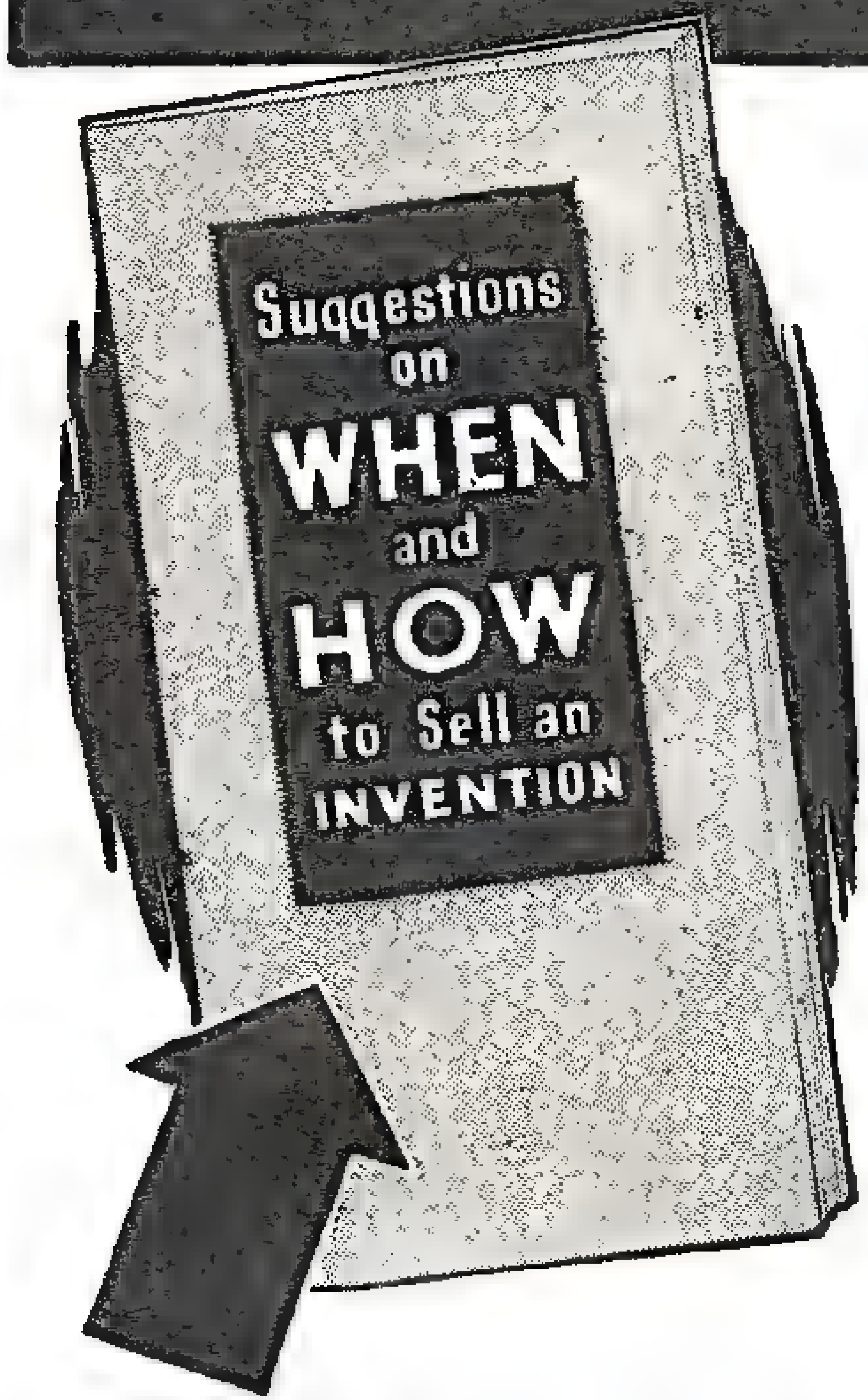
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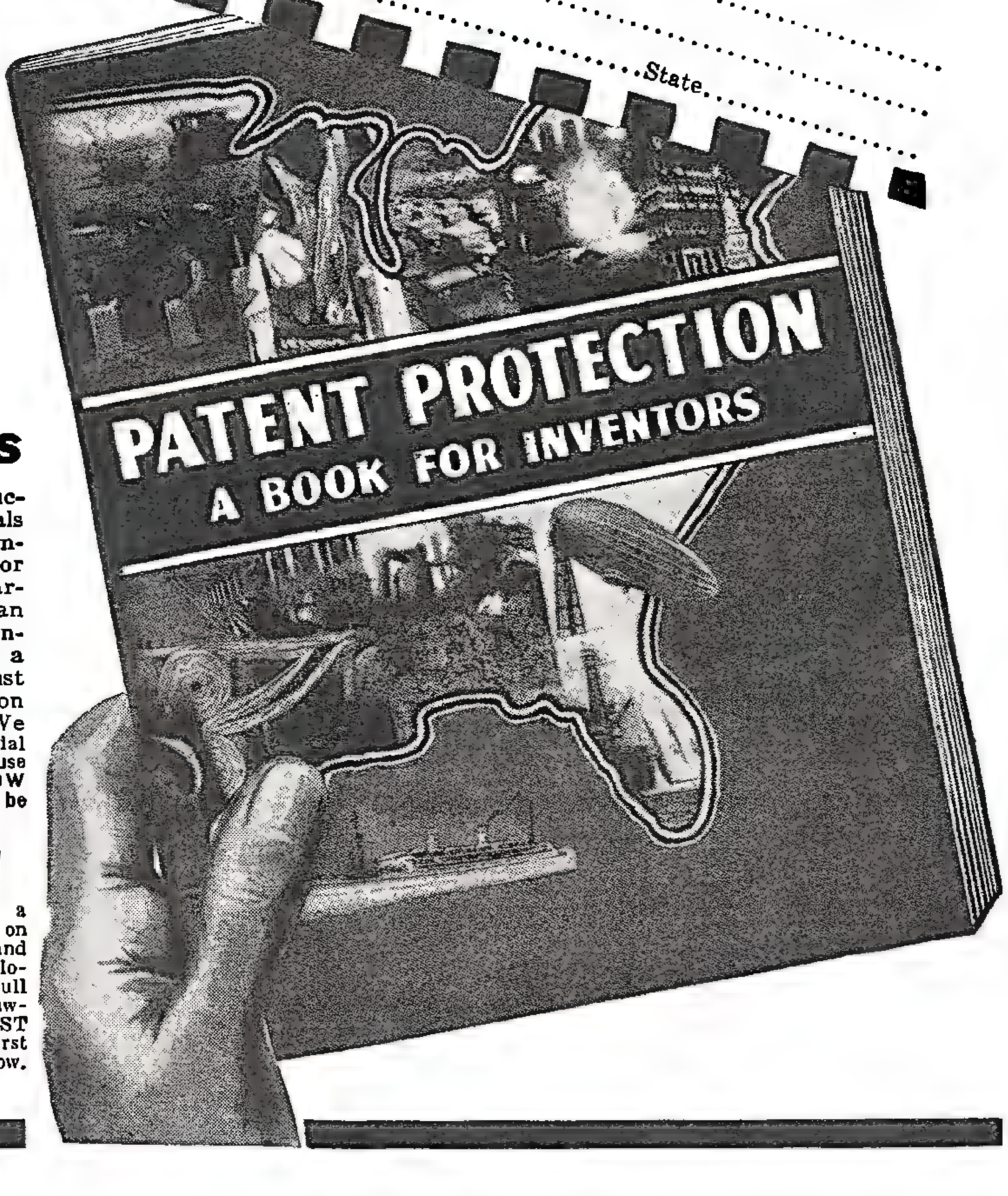

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according to

DR. W. BERAN WOLFE

in the April

MOTION PICTURE

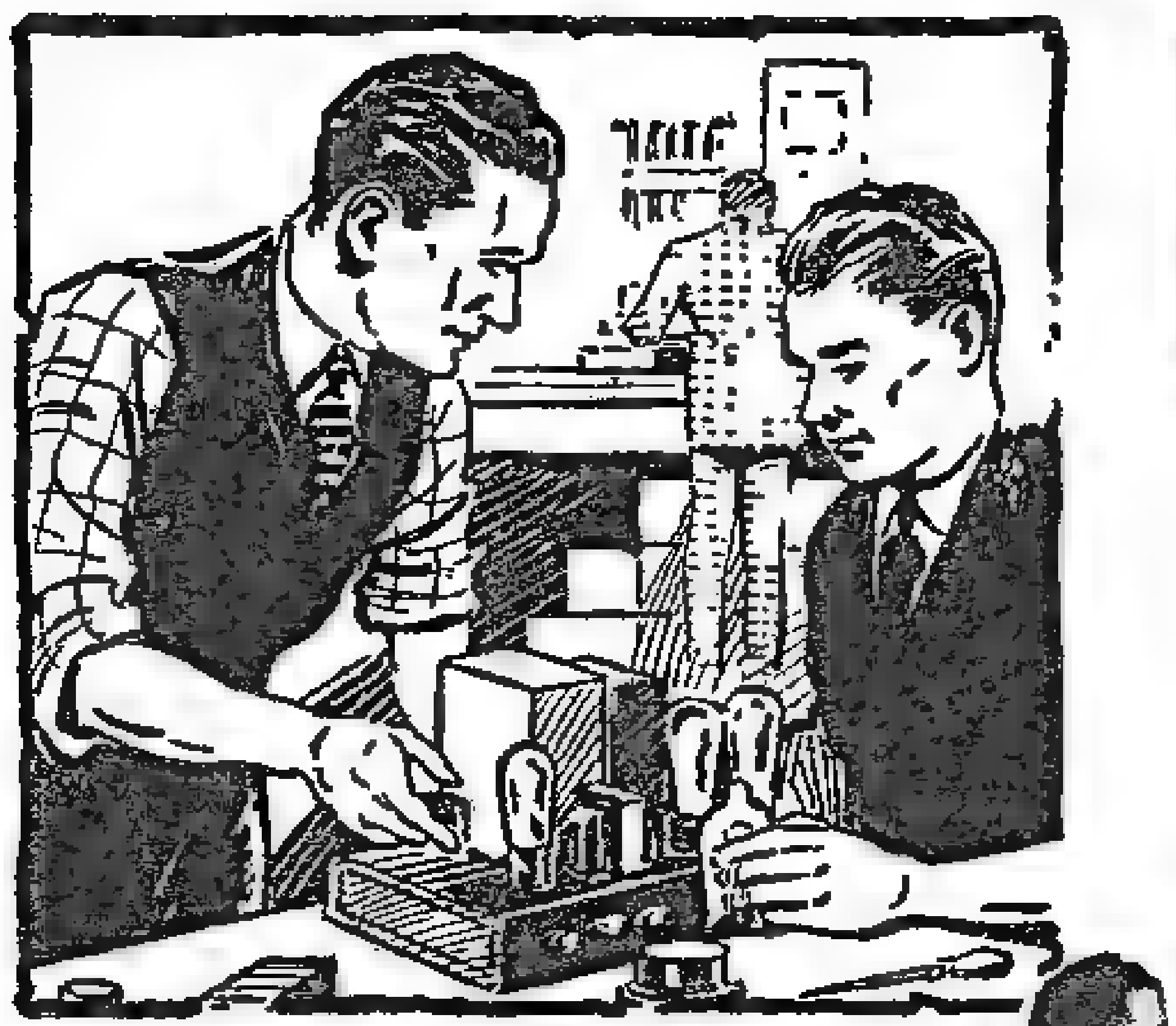
"As long as our schools and universities do not institute courses in the art of being a good lover, the art of being a good wife, the technique of holding your husband, or the science of making your wife contented, lovers, old and young, male and female, will have to find instructions wherever and however they can . . . . By and large, Mr. and Mrs. John American go to the movies for instruction in love."

LEDERER: MAN OF ACTION, also heads the list of features in the new ten cent *MOTION PICTURE* for APRIL.

MOTION PICTURE
10¢
LORETTA YOUNG
LIKE A MOVIE STAR?
PRIZE CONTEST

Now 10¢

Be a RADIO EXPERT



But Get Your Training Now, from REAL RADIO ENGINEERS!

Learn Radio from these men! Just see who they are! All top-notchers in their profession—selected by the great Radio concerns they work for to supervise and direct your Training. Learn Radio the way the Radio Industry wants you to learn it—the Shop way—the practical way—the real money-making way.

Only the Radio & Television Institute can offer you this chance to get your Training from real Radio Engineers working right in the heart of the Radio Industry.

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Karl E. Hassel, Chief Engineer, Zenith Radio Corporation,

H. C. Tittle, Chief Radio Engineer, General Household Utilities (Grunow),

F. D. Whitten, Service Manager, Chicago Branch, Philco Radio & Television Corp.
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MANY R·T·I· TRAINED MEN *Earn* $50 *to* $75 *a week*

Don't waste time on a small-pay, no-future job when hundreds of men are drawing down $50 to $75 every Saturday as R-T-I Trained Experts. Get ready for a real job. Get into Radio now. My big FREE book tells you how you can learn at home to fill good-pay full-time or part-time Radio jobs.

Good-Pay Opportunities, Everywhere

Broadcasting Stations, Factories, Dealers and Distributors and others all use "trained" men, and pay up to $5000 a year. Auto Radio, Short Wave Radio, Photo Cells, Public Address Systems and Sound Pictures have created thousands of good-pay jobs. This is a big year for Radio. New developments in receivers alone, demand up-to-date trained technical men. Get the facts in my free book.

Learn At Home, In Spare Time

Hold your job. Keep down expenses. My famous method of home training—*endorsed by more than 50 leading Radio manufacturers*—gives you simplified, practical training along workshop lines. In a few short months many R-T-I Trained men step out of poor-pay, no-future jobs into big-future Radio work paying $50 to $75 a week and up.

Many Make $5 to $20 A Week Extra In Spare Time, While Learning

C. E. Head, Alexandria, La., wrote: "Made $14.25 in spare time eleven days after enrolling." L. M. Christensen, Deweyville, Utah, wrote: "Got my first spare-time job two weeks after enrolling. Have already made $250 doing spare-time Radio work."

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These outfits developed by Engineers directing R-T-I Training to make your Training Real Shop Training for the home. Can be used in your service work.

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To learn Radio my way you don't have to be a College man, or even a High School graduate. My Training is practical shop training for the home. It is the Training endorsed by 50 leading radio manufacturers.

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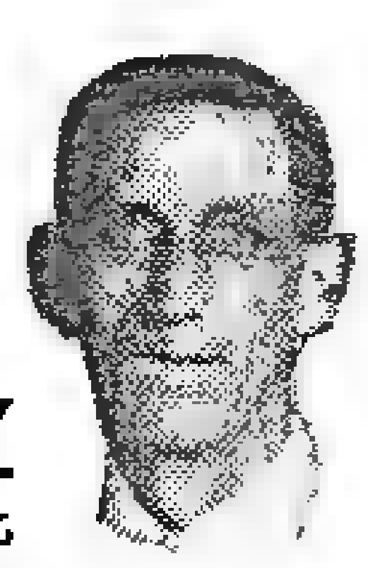
Mail Coupon

SEE WHO THEY ARE! READ WHAT THEY SAY ABOUT R.T.I. TRAINING. FIND OUT WHY THEY ENDORSE AND RECOMMEND THIS SCHOOL



Dear Mr. Smith: Due to my R-T-I Training I was made manager of the Radio Department of a city department store, working up over the other four service men who had been there for some time.

Howard N. Lentz
123 W. Alexander St.
Buchanan, Mich.

Dear Mr. Smith: My knowledge of Radio, gained through R-T-I Training, has won me the position of assistant to Chief Engineer of Radio Station WHO. The pay is very good and every day I make use of what I learned in your lessons.

D. A. Whitney
Des Moines, Iowa

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See who these big Radio firms are and why they endorse R-T-I Training and recommend it to you. See the hundreds of pictures, the proofs, the enthusiastic letters of R-T-I men. Act today. Mail the coupon now.

RAY D. SMITH, President
RADIO & TELEVISION INSTITUTE
CHICAGO

RAY D. SMITH, President,
Radio & Television Institute (R-T-I)
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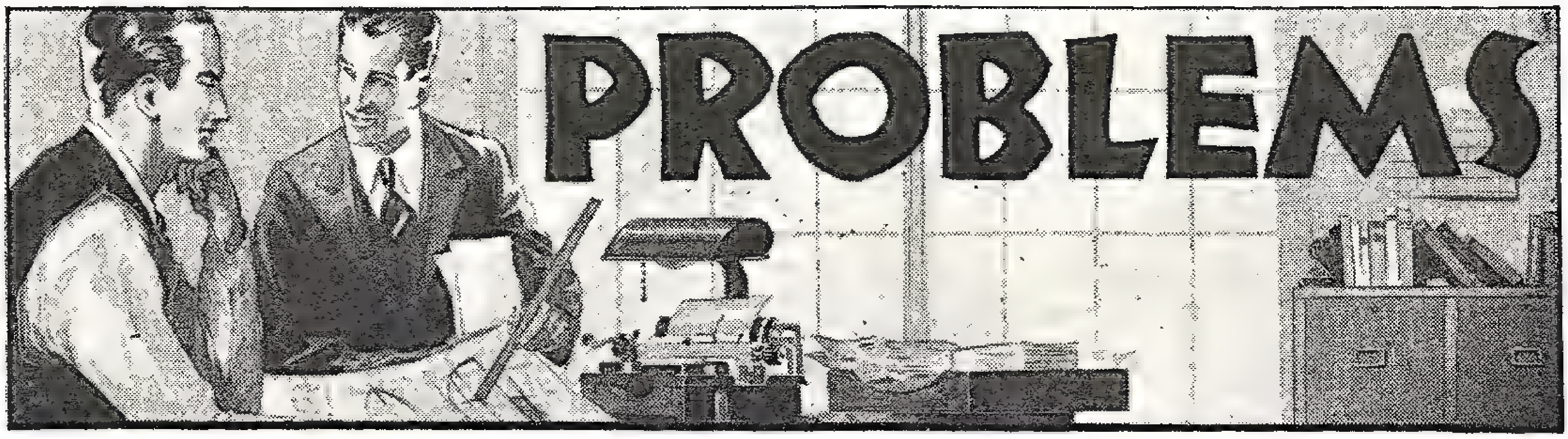
Chicago, Ill.

Dear Mr. Smith: Without obligating me, send me your book that explains your Engineer-Directed and Industry-Endorsed method of training men quickly and inexpensively at home in their spare time to be Radio Experts.

Name ....

Address.............................. Age.........

City...............................State.......



Watch this page for the solution of your own mechanical problem.

USING OUTBOARD MOTOR INBOARD

I would like to use an outboard motor in getting my 27-foot sailboat in and out of a crowded harbor, but find it impractical to mount it at the stern in this particular boat. Do you think it practical to place the motor inboard, with the shaft going vertically through the hull through a pipe and bushing arrangement, about 6" to either side of the keel?—R. E. W., Chattanooga, Tennessee.

A British outboard engine manufacturer is now supplying an adaptor for stock outboard motors which permits inboard use. The problem, of course, is to get a perfectly water-tight bearing. We would suggest you consult with the manufacturers of your particular engine; they may be able to supply the special bearing needed. Many sailboats in this country could use such an outboard-inboard rig to advantage.

MAKING LUMINOUS PAINT AT HOME

Do you have a simple formula for making luminous paint suitable for outlining house numbers?—M. M. M., Clay Center, Nebraska.

Paint made according to this formula will give off a violet light at night: Take 100 parts by weight of strontium carbonate, 100 parts sulphur, .5 parts potassium chloride, and .4 parts manganese chloride. Heat these materials for from ¾ to 1 hour, to about 2,350 degrees F. To make this phosphorescent paint effective, expose for a time either to direct sunlight or to a mercury vapor lamp.

TWO CARBURETORS ON AUTO

I had the intake manifold of my 1929 Ford rebuilt to take two carburetors, but now only two cylinders work good at a time. Different cylinders can be made to fire properly by adjusting the carburetors, but there are always two which fire weak. Please tell me why my Ford will not work with two carburetors.—K. O. K., Wadena, Minn.

With two carburetors you are supplying too much rather than too little gas, and flooding one or more of the cylinders. The unburned fuel simply retards the combustion. We doubt whether it is possible to get the two carburetors to supply exactly the same amount of fuel at the same pressure to make all four cylinders respond alike to the throttle.

SELLING MINERAL RODS

I can make mineral rods which will work as well as any now on the market, giving a signal when the contact points are pushed against metallic bodies buried in the ground. Though my rods are the same shape as those now out, they are larger and made from different metals. Can I sell my own rods without getting into trouble because of patents?—J. F. S., Dover, New Hampshire.

If the principle upon which your mineral rod works is the same as that of some patented product, you are of course infringing, regardless of whether you change the size and color, or use different materials. We advise you to have a reliable patent attorney check over existing patents on mineral rods first.

BULLET TRAJECTORIES

Why are the rear sights of rifles always raised when shooting at distant targets?—W. D. L., Fulton, Mo.

A rifle bullet drops 32.2 feet for every second of its flight, regardless of the speed it is traveling, because of the force of gravity. With the rear sight raised the proper distance, the barrel automatically is elevated enough to offset this force of gravity when the sights are on the target.

RECUTTING OLD FILES

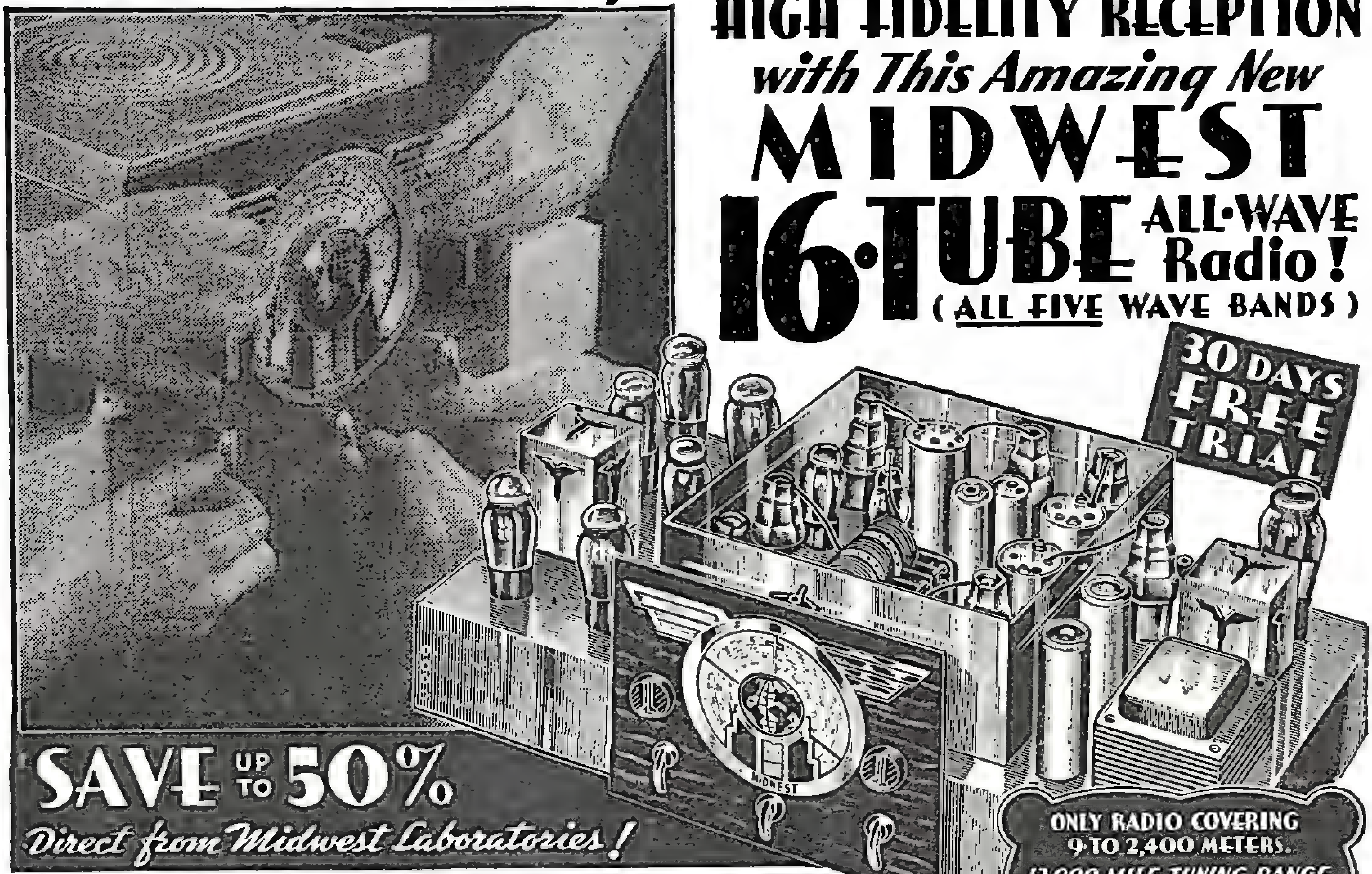
Can old files be treated in any way to make them serviceable again?—R. S. J., St. Louis, Mo.

Boil the files in a strong bath of caustic potash, clean with a hard brush, then wipe off the liquid. Dip into nitric acid for half a minute, then move the file over a blotter or cloth stretched tightly over a flat surface. This will leave acid in the grooves, cutting them deeper. Repeat the acid treatment until the desired depth is obtained, then rinse and dry the files. Apply olive oil, wiping off any ex-

[*Continued on page* 19]

Invisible Hands Magically Assure WORLD-WIDE HIGH FIDELITY RECEPTION *with This Amazing New* MIDWEST 16-TUBE ALL-WAVE Radio!

(ALL FIVE WAVE BANDS)



ONLY RADIO COVERING 9-TO 2,400 METERS.
12,000 MILE TUNING RANGE

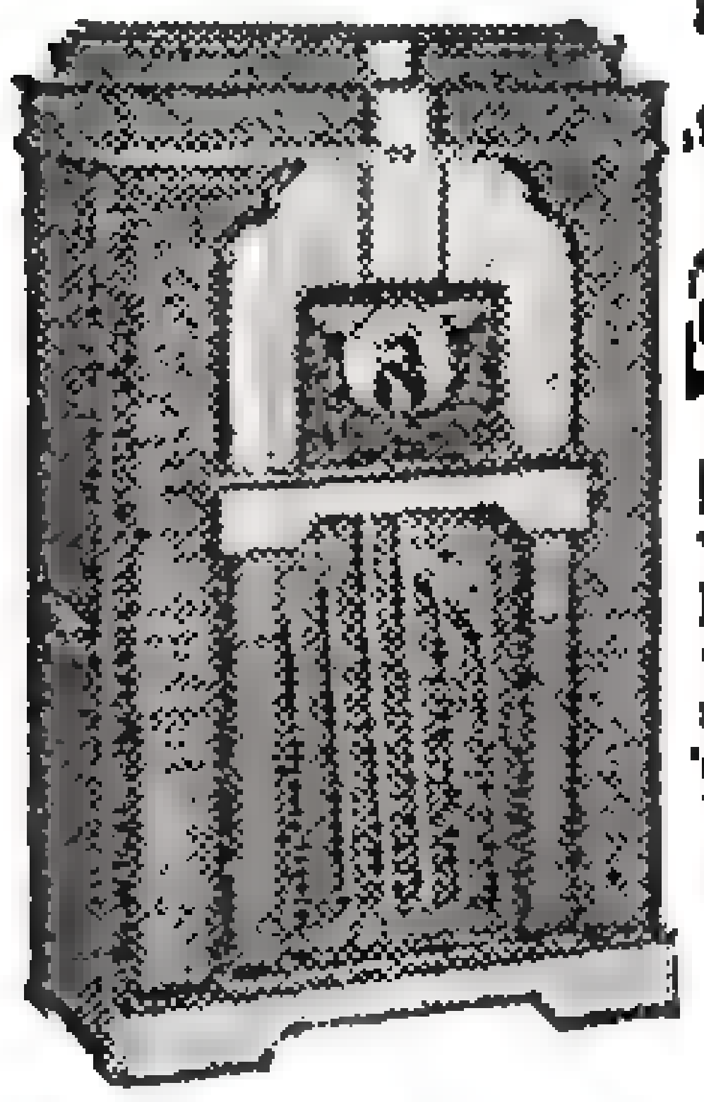
WORLD'S GREATEST RADIO VALUE
$57.50 *with New Deluxe Auditorium-Type* SPEAKER

THE almost magical performance of this super radio is startlingly human! As domestic and foreign stations are brought in, many automatic adjustments are constantly being made inside the set. It might be said that a number of "Invisible Hands" enable you to bring in and hold any station you desire from the whole world of broadcast ...regardless of fading and interfering conditions. Before you buy any radio, write for the new FREE Midwest "Fifteenth Anniversary" catalog and see how you can save from ⅓ to ½ by buying direct from Midwest laboratories. Learn why Midwest outperforms sets costing up to $200.00 and more. Now save 30% to 50%. Never before so much radio for so little money! Midwest gives you triple protection with: **One-Year Guarantee, Foreign Reception Guarantee, Money-Back Guarantee.**

Only Midwest Offers Multi-Function Dial

This exclusive dial is not an ordinary airplane dial—but a many-purpose unit that performs exclusive functions. Send for FREE miniature dial showing these outstanding advantages:

1. **Dial calibrated in Kilocycles, Megacycles and Meters;**
2. **Call Letters of American Broadcast Stations printed on Dial and Illuminated;**
3. **Slow-Fast, Smooth-Action Tuning;**
4. **Station Group Locator;**
5. **Simplified Tuning Guide Lights;**
6. **Automatic Select-O-Band Indicator;**
7. **Illuminated Pointer Indicator;**
8. **Silent Shadow Tuning;**
9. **Centralized Tuning.**



New Style Consoles

The Midwest 36-page catalog pictures a complete line of beautiful, artistic de luxe consoles and chassis in four colors. Write for new FREE catalog today! **Midwest long-range radios are priced as low as . . . $27.50**

50 ADVANCED FEATURES

Exclusive "Invisible Hands" features include: High Level Automatic Volume Control Action, Discriminating Automatic Tone Control, Multi-Function Dial, Micro-Tenuator, Fidel-A-Stat, etc. Only Midwest covers a tuning range of 9 to 2400 meters (33 megacycles to 125 KC)—enabling you to easily and successfully tune in even low-powered foreign stations up to 12,000 miles away. All 5 Wave Bands enable you to enjoy today's finest High Fidelity American programs. In addition, you get Canadian, police, amateur, airplane broadcasts, commercial and ship signals...and delight in exciting world-wide broadcasts from England, France, Germany, Spain, Italy, Russia, Australia, etc. Send today for money-saving facts!

SENSATIONAL HIGH FIDELITY RECEPTION

This bigger, better, more powerful, clearer-toned, super-selective, 16-tube "Invisible Hands" radio gives you absolute realism—assures you of life-like, crystal-clear tone, unlike anything you have ever experienced before. You will hear one more octave—overtones—that cannot be brought in with ordinary radios. Now, hear every instrument, every voice, every shade and inflection of speech.

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SAVE UP TO 50%

Increasing costs are sure to result in higher radio prices soon. Buy before the big advance ...NOW...while you can take advantage of Midwest's sensational values. No middlemen's profits to pay! You can order your Midwest High Fidelity radio from the new Midwest catalog with as much certainty of satisfaction as if you were to select it in our great radio laboratories. You save 30% to 50% when you buy this popular way...you get 30 days FREE trial...**as little as $5.00 down** puts a Midwest radio in your home. Foreign Reception, One-Year and Money-Back GUARANTEES protect you! Write for FREE catalog NOW...TODAY!

TERMS as low as $5.00 DOWN

Hears His Native Country

Acushnet, Mass.—I tuned in CTIAA, Lisbon, Portugal, my birthplace...clear as a local. Heard news, music and songs of my country. This alone is worth more than low price I paid for my Midwest. Also tuned in GSB, England 12RO, Rome... DJA, Germany and many other foreign stations. Anibal N. Ferreiria.

MAIL COUPON TODAY! FOR *FREE* MINIATURE DIAL..... *FREE* 30-DAY TRIAL OFFER.. *FREE* CATALOG

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Without obligation on my part, send me your new FREE 1935-36 catalog, FREE Miniature Dial, and complete details of your liberal 30-day FREE trial offer. This is NOT an order.

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Check Here for Details ☐

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☐ Check here, if interested in Midwest World-Wide Battery Radio.
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WOOD IN CANS WILL FIX THESE OLD NAIL AND SCREW HOLES

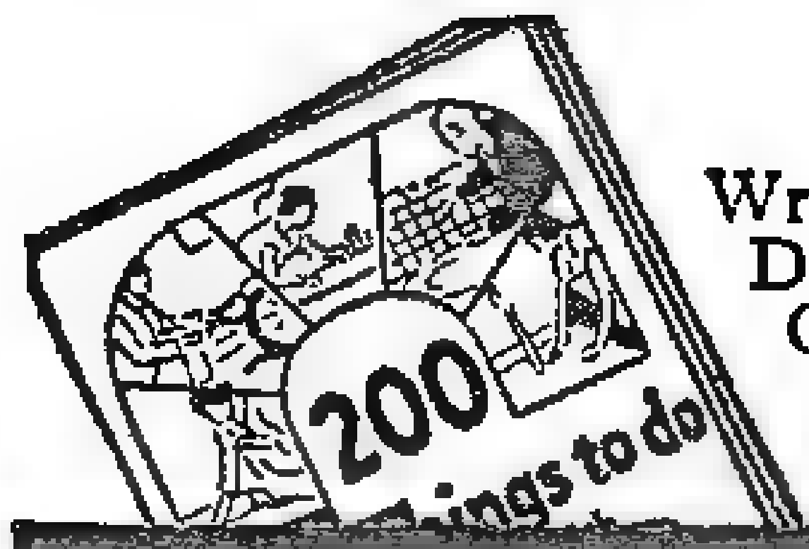
PLASTIC WOOD

Handles Like Putty Dries to Hard Wood

Plastic Wood Becomes a Permanent Part of the Object Repaired

Plastic Wood is actual wood that comes in cans and tubes—can be moulded with the hands—when dry it is hard, permanent wood that can be sawed, planed, sanded, drilled, turned on a lathe—will hold nails—can be painted, varnished and lacquered perfectly—it is water-proof and weather-proof.

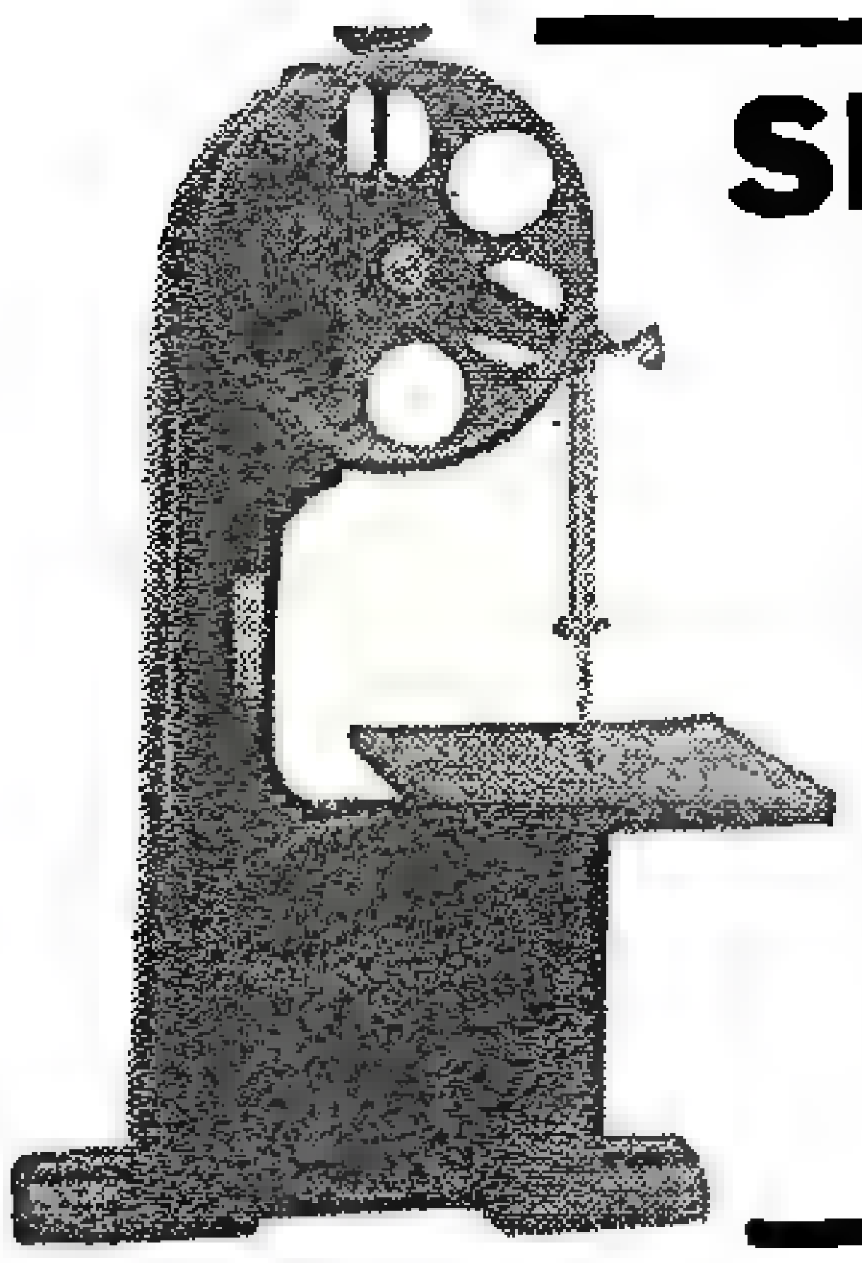
Plastic Wood will adhere to any clean, dry surface—wood, metal, glass, stone or porcelain. Sold at all paint, hardware and department stores.



FREE

Write The A. S. Boyle Co., Inc., 1934 Dana Ave., Dept. M. M. 4, Cincinnati, Ohio, for interesting booklet, "200 Things to Do With Plastic Wood."

PLASTIC WOOD



Shaw Band Saw

Six inch Band Saw cuts stock 2½" thick. Tilting Table 8"x8", $\frac{3}{16}$" or ¼" Saws, Roller Guide, one piece iron frame. Send $1.00. Bal. C.O.D.

Complete with Saw Postpaid in U.S.A. $5.25

SHAW TOOL CO.
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new- READY SHAPED LOW COST RACING CRAFT

Get this sensational sailboat kit. Make authentic speed models in a few hours. All the hard work is done for you. Hull is already shaped and **hollowed.** Needs only smoothing down and painting. Then you "step" mast, adjust sail, rigging and rudder and she's ready to launch! Watch her go! See her outdistance all competition. Easy to follow instructions and all necessary parts furnished.

Kits as Low as 25c . . . Buy Racing Craft Kits at dealer or department store. If they can't supply, send money order for 7" solid hull kit, 25c, 15" hollow hull kit, $1 00, or 22" hollow hull kit, $2 50. Sent prepaid in U. S. All materials guaranteed. Send for Big Free Thornecraft Book. Shows larger sailboats, Speed Scout Motorboats, Rotoboat, and Buck Rogers Stratosphere Balloon.

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ENGINEERING DEGREE IN TWO YEARS

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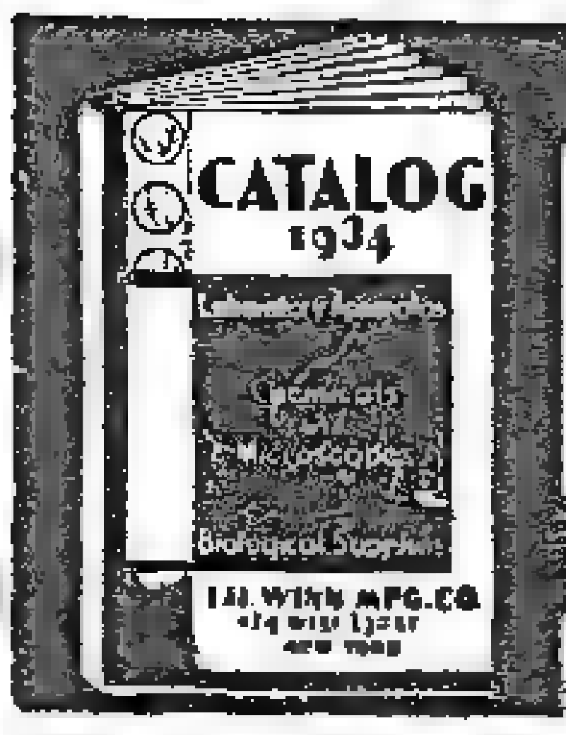
ARE YOU NERVOUS? WORRIED? UNHAPPY?

What's wrong with you? Do symptoms of **Constipation, Indigestion, Dizzy Spells, Sweating and Sleeplessness** keep you irritable, exhausted and gloomy? Are you Bashful? Despondent? ***There's Help for You!*** Medicines, tonics or Drugs probably will not relieve your weak, sick nerves. My wonderful book "*Watch Your Nerves*", explains a new method that will help you regain lost vitality and healthy nerves. Send 25c for this amazing book. **ROBERT HOLMES, 134 Fuller Bldg., Jersey City, N. J.**

FREE CATALOG OF PRACTICAL BOOKS . . .

Complete description of Drake books, covering RADIO, AVIATION, ENGINEERING, AUTOMOBILE WORK, BATTERY WORK, ELECTRICITY, BUILDING, SHEET METAL WORK, PAINTING, SIGN MAKING, LETTERING, COMMERCIAL ART, will be sent to you on request.

Frederick J. Drake & Co., Dept. 202
179 N. Michigan Blvd. Chicago



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The American Electric Method enables you to build a nice business of your own. Income practically unlimited. Government Housing Program creating greater field than ever. Work easy to get by our tested plan. Small amount starts you. Write today —No obligation.

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Make money taking pictures. Prepare quickly during spare time. Also earn while you learn. No experience necessary. New easy method. Nothing else like it. Send at once for free book, OPPORTUNITIES IN MODERN PHOTOGRAPHY, and full particulars.

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Dept. 2054, 3601 Michigan Avenue Chicago, U. S. A.

Problems Editor Answers Queries

[*Continued from page* 16]

cess, to retard clogging of the teeth and make cleaning easier. Clean the file with a scratch brush and add more olive oil after use each time.

Files often lose their cutting power because the grooves become clogged with filings and only a small fraction of the cutting edges are effective. Where iron is clogging the file badly, immerse the file in blue vitriol (copper sulphate) for a few minutes, rinse in water, and then use the nitric acid treatment. File ridges filled up with zinc can be cleaned with dilute sulphuric acid.

HEADPHONES ON MODERN RADIO

How can headphones be hooked up to a modern radio set having a dynamic speaker?—H. L. L., Chicago, Ill.

Loudspeaker and phones can be operated at the same time with fair results by connecting the earphones in series with the speaker voice coil. To operate the phones alone, short out the voice coil, or replace with a 10,000 ohm volume control. The voice coil leads are those going to the tiny coil pasted on the paper cone.

DIAMAGNETIC METALS

When a bar of pure bismuth is placed near the poles of a permanent magnet, would the repelling force be as strong as the attractive force obtained with an iron bar of the same size?—R. J. B., Ontario, Canada.

Though bismuth is the strongest diamagnetic metal known, it is pushed away from a permanent magnet with only a small fraction of the force with which the same magnet would pull iron. This effect can easily be demonstrated with a strong permanent magnet.

HOMEMADE DIVING SUITS

I would like to make a waterproof suit for use with the diving helmet described in the 1934 How To Build It book. What materials will serve best as a protection against cold water?—F. S., Pontiac, Mich.

Rubberized cloth, obtainable at photographic supply stores, under the name of "focus cloth," is a light, strong and waterproof material which could be used for a diving suit. All seams can be fastened with rubber cement. You may also use ordinary canvas which has been thoroughly impregnated with a mixture of one pound of paraffin dissolved in one gallon of gasoline. Soak the canvas in this after sewing the seams. Double stitch all seams.

(Editor's Note—All letters sent to this department should include a stamped, addressed envelope. Write to M-M Problems Editor, 529 South 7th Street, Minneapolis, Minn.)

CLEAN OUT YOUR RADIATOR
FOR SAFE SUMMER DRIVING

WHEN you drain out your anti-freeze, drain out the rust, scale and impurities that have collected during the winter. Give the radiator a thorough cleansing with Sani-Flush. You can do it yourself. In very few minutes. For very few cents. Absolutely safe.

Just pour half a can of Sani-Flush in your radiator. (Directions on the can.) Run the engine. Drain out the dirt that clogs the cooling system. Your car will run better. You'll save expensive repair bills.

You'll probably find Sani-Flush in your home. Thousands of women use it to keep toilet bowls glistening. If it's not there, buy a can from any grocery, drug, or hardware store — 25c. The Hygienic Products Co., Canton, Ohio.

Sani-Flush 25¢
KEEPS RADIATORS CLEAN

C H E M I S T R Y

COMPLETE, practical home-study courses prepared by some of the best-known chemists in this country, including ALLEN ROGERS, B.S., M.S., Ph.D.—Head of Department of Industrial Chemistry, Pratt Institute; L. M. TOLMAN, Ph.D.—Formerly Chief Chemist, Wilson & Co. Now Vice-president, United Chemical and Organic Products Co.; BRADLEY STOUGHTON, B.S.—Head of the Department of Metallurgy, Lehigh University, and OWEN L. SHINN, Ph.D.—Professor of Applied Chemistry, University of Pennsylvania.

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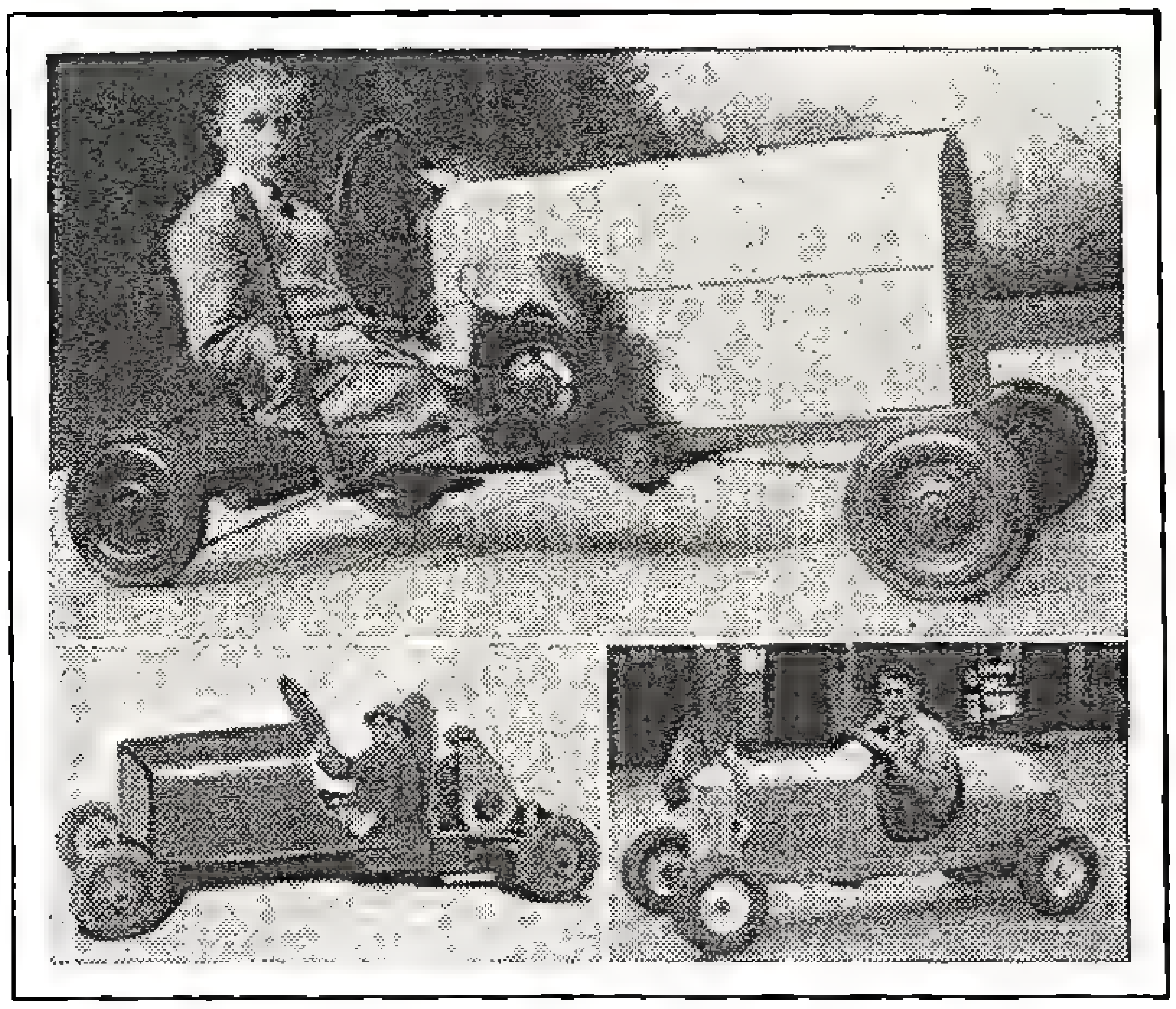
☐ Analytical Chemistry
☐ Chemical Engineering
☐ Industrial Chemistry
☐ Short Chemistry Course
☐ Pharmacy

Name..

Address..

Random Chips from

Midget car fans, boat builders, and radio hams, here's good news for you. And if you are planning an auto trailer, get inside information here on a movie star's trailer that you can build from MM.



Three types of midget cars built by MM readers. Jere McWethy, 12 years old, of Aurora, Ill., built the car at top. Jack Pinnick, 16, made a chassis of bed rails for the car at left. Ken Leiser of Madison, Wis., uses the car at right for advertising at his filling station. Jere and Jack have Briggs and Stratton motors. Ken has a one lung motorcycle engine.

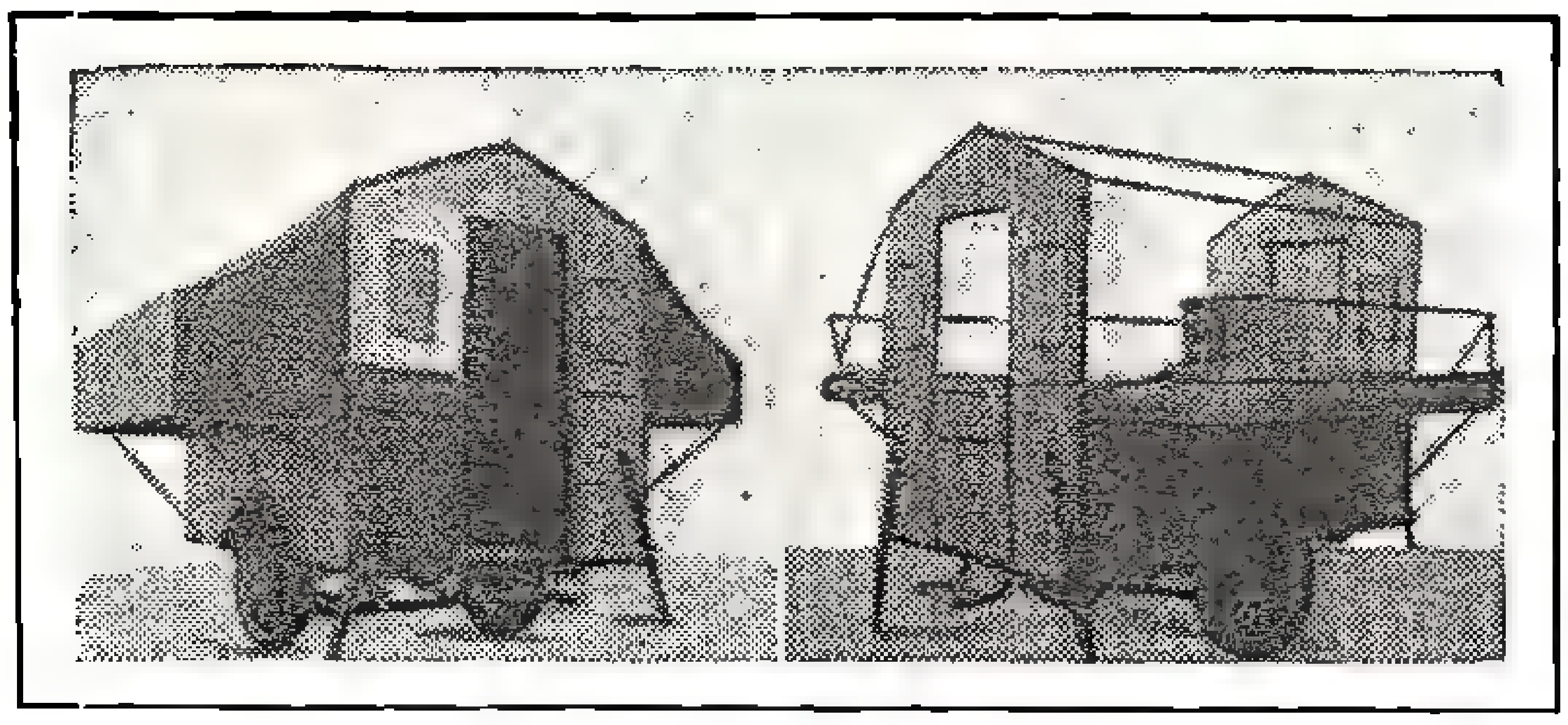
WHEN we published that excellent story in the March MM, "Television Will Carry the Mails," we overlooked granting Alfred Albelli his just credit for obtaining that instructive and revealing article from David Sarnoff, President of the Radio Corporation of America. To be fair to both Mr. Sarnoff and Mr. Albelli, our New York correspondent, the by-line on the story should have read "By David Sarnoff, President of R. C. A., as told to Alfred Albelli."

* * *

Spring may stir some persons to poetry, but it brings the home worshop fan out of hibernation.

Judging from the letters we have been receiving, he wants to build midget cars, automobile trailers, portable radios, and boats. This issue has them all except the trailer—and we'll tell you about that later.

We're not trying to sell you this issue because if you've got this far you've already bought it. But you had better get your order in now for the May MM. It will contain one of the most unusual automobile trailers you have ever seen and it comes to us right from Hollywood. We'll keep you guessing what movie star's trailer it is until next month.



J. E. Bowers took third prize with these photos of his bungalow trailer. At left trailer is ready to be occupied. Frame work without canvas roof is shown at right. Trailer folds up.

* * *

Before you build another radio set get a copy of MM's newest book, "Radio Builders' Manual." There is nothing like it on the market. It has everything—short wave sets, converters, adapters, auto radios, all-wave receivers, transmitters, and crystal sets. It's written so that anyone can build a set that will work and get distant stations. "Radio Builders' Manual" will be on the newsstands in a few days. If you want to get your order in early, send 50 cents to MODERN MECHANIX AND INVENTIONS, 529 S. Seventh St., Minneapolis.

This 15-foot boat, his first wood working project, won second prize for O. H. Ryerson, Columbus, O.

* * *

Let's get around to our prizes and letters before they get squeezed out. First prize of $5.00 for the best picture of the month goes to Harry Sapp, the first reader to send us photos of the "knee action" midget car in the September, 1934, issue of MM. He tells us:

the Editor's Workbench

Mt. Holly N. J.

Dear Editor:

Enclosed find photos of a power pushmobile that I have built and tested. The motor was formerly a two cylinder motor, but one of the walls became cracked so I converted it into a one lung affair.

The car was built from your September issue. Wagon wheels were used with 1½" by 3" stock. The free action in the front really helps because it keeps the frame from twisting.

It worked the first time I took it out and attained a speed of approximately 25 m.p.h. Several boys in town are building the midget and we might lay out a track and race them.

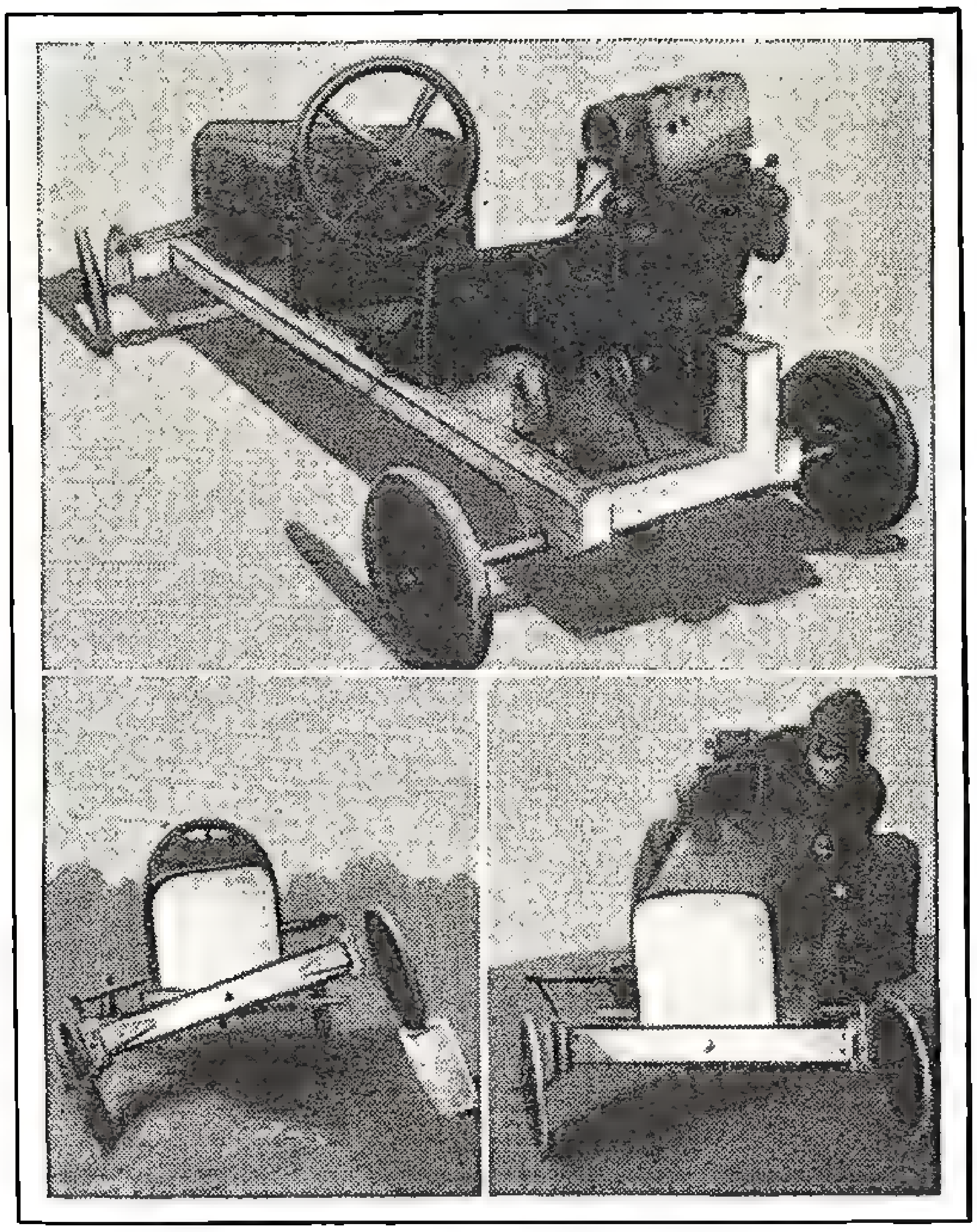
Harry Sapp.

Jack Miner, owner of a famous game farm, caught lake trout by taking Robert Page Lincoln's tips.

Twenty-five miles an hour on half an engine? Wonder what kind of speedometer Harry used? Well, he gets the five dollars anyhow.

* * *

The man who tackles a fifteen-foot boat as his first woodworking project ought to get a prize. That's why we sent a check for $3.00 as second prize to the writer of the following letter:



Construction of this "knee-action" midget car was described in the September MM. Harry Sapp built it, sent in the photos and won first prize of $5.00 in this month's contest.

Columbus, O.

Dear Editor:

Enclosed herewith is a snapshot of a Doane Hydrobout, 15½'x5'2", powered with a Star motor. The speed is approximately 27 miles per hour.

The framework is constructed entirely of inch white oak. By following Doane's con-

[*Continued on page* 22]

"REAL SHAVING COMFORT NEVER COST ME SO LITTLE!"

● "I never dreamed a low-priced blade could shave a tough beard like mine until I tried Probak Jr." writes T. C. Schreiber, Jr. "Now I get clean, easy shaves with never a bit of irritation and I'm saving money on razor blades."

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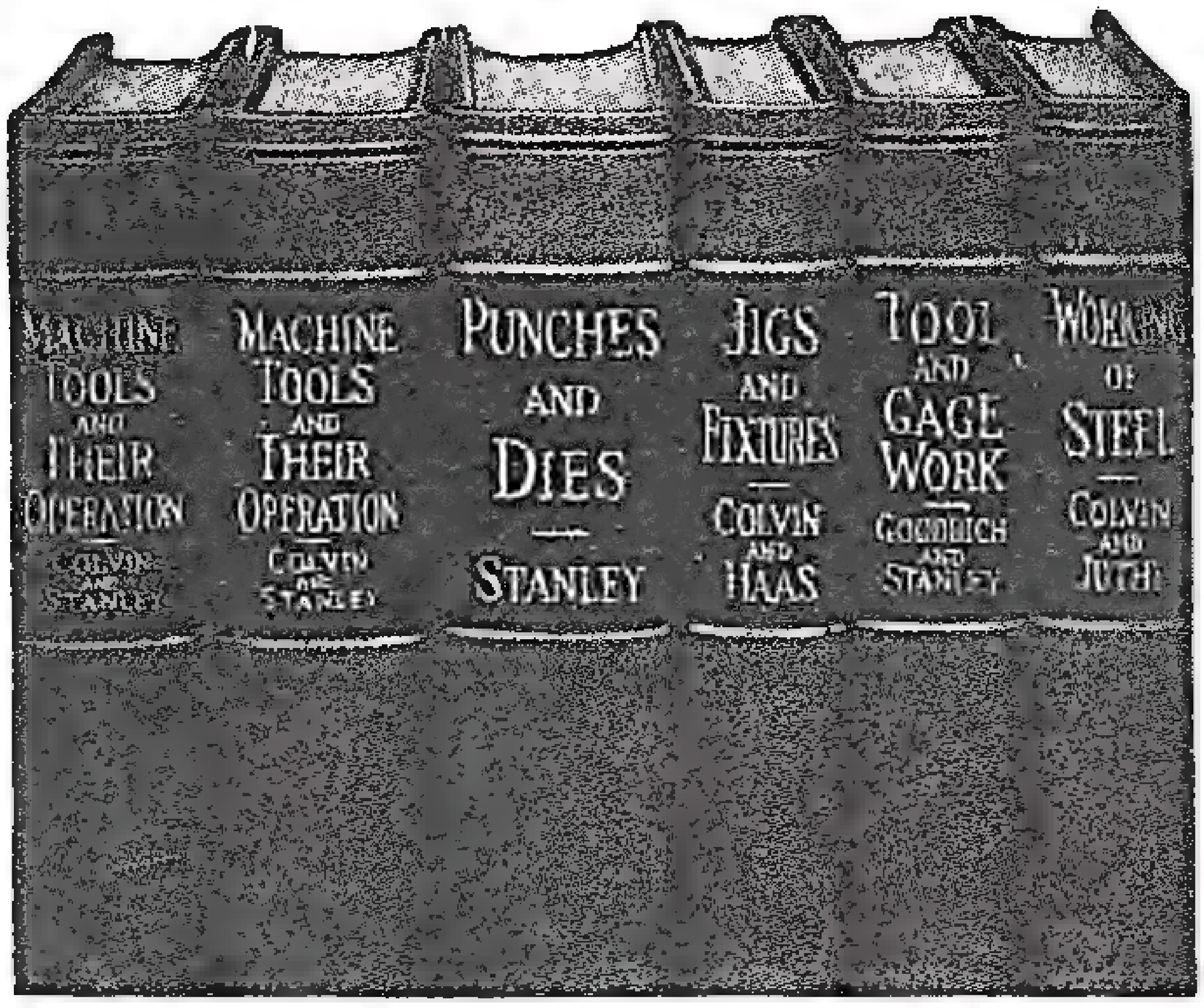
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Chips from the Editor's Workbench

[*Continued from page* 21]

struction plan exactly, I have built an absolutely tight boat.

This boat was built entirely with hand tools and only four boat builders clamps. It is the first boat I ever built and also it is the only woodworking job I ever attempted.

O. H. Ryerson.

* * *

Third prize of $2.00 went to another MM project, a collapsible automobile trailer.

West Allis, Wis.

Dear Editor:

I am enclosing snapshots of the Bungalow Camp Trailer that I built from plans shown in MM (May, 1932, also first edition of Handy Man's Home Manual).

The trailer may be set up in 12 minutes by one person.

J. E. Bowers.

* * *

Here's a letter to Robert Page Lincoln. Jasper Miner and his father, Jack, run one of the largest game farms in the world.

Kingsville, Ont.

Dear Mr. Lincoln:

I have been accustomed to going into Northern Ontario each fall to hunt moose. While there I heard of an inland lake six miles west of us which contained lake trout. Your articles on casting for lake trout last spring influenced me so much that on May 23 my father and I took a week's trip to this lake.

We put up our tent and went out to try the trout. I started casting. I noticed my plug coming in about six feet from me and right behind it I caught a glimpse of a fish following it. The plug got just under the boat about to come out of the water when the trout arose swiftly and struck and whirled straight down and almost tore my rod inside out. Finally the trout gave up and rose about thirty feet behind the boat. I reeled in and after much splashing at the side of the boat I lifted him in. My, he was a fine fat fish, my first lake trout and he weighed almost four pounds.

Well, do you know we fished for two days steady and never caught another trout? The last day there I went just below a dam and caught three lake trout in ten minutes.

Jasper W. Miner.

Miner goes on to ask if he should return to the lake about May 8 when the ice goes out, if he should use live bait, and what plugs should be used. Lincoln told him that a wobbling spoon is far more successful than live bait and that trolling will get the bigger trout. He also said that the best time to go after trout is just after the ice goes out.

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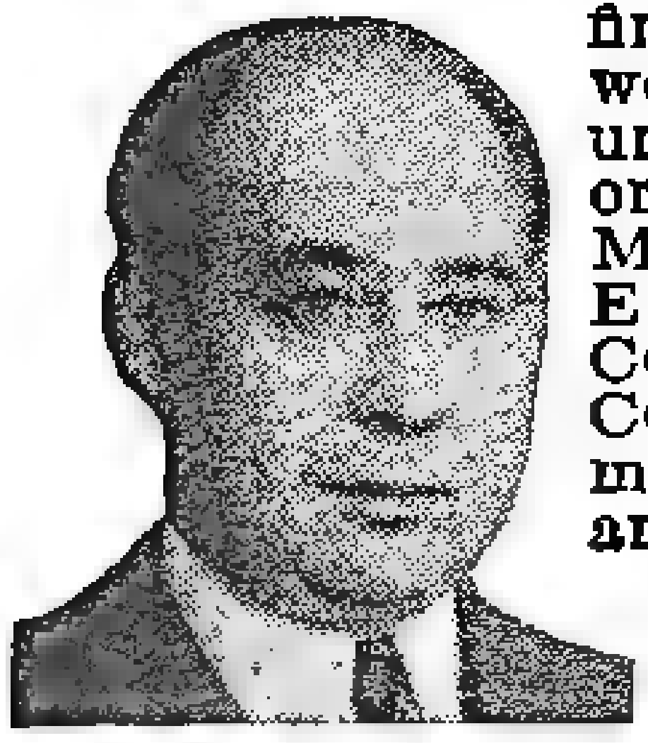

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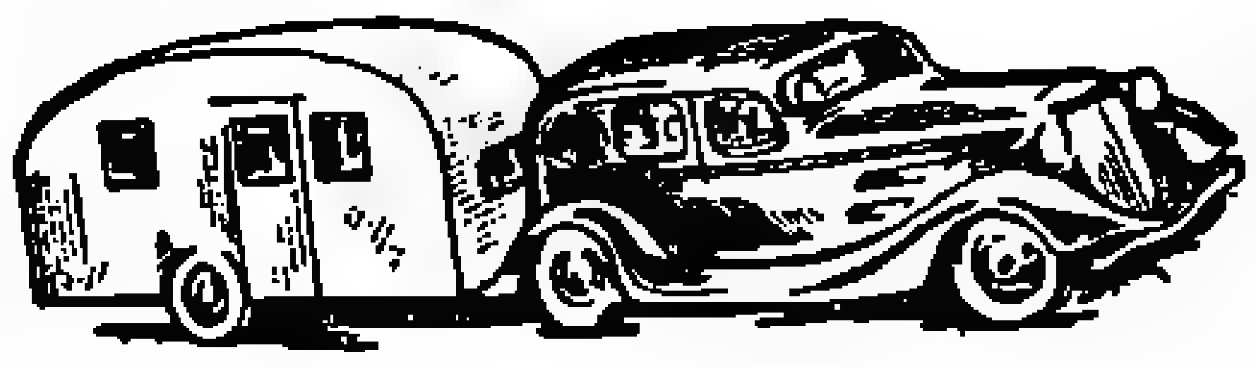

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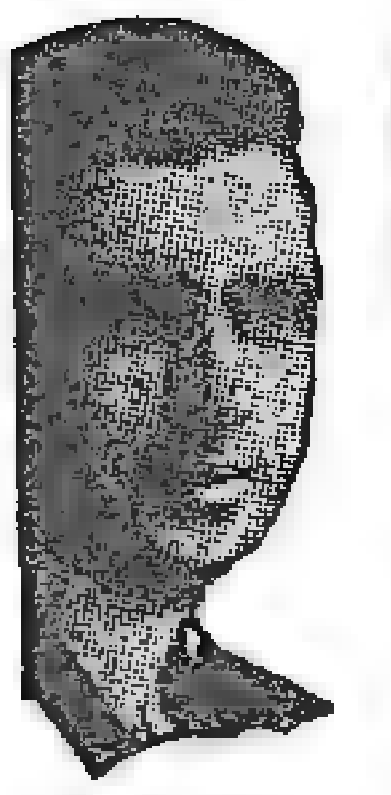

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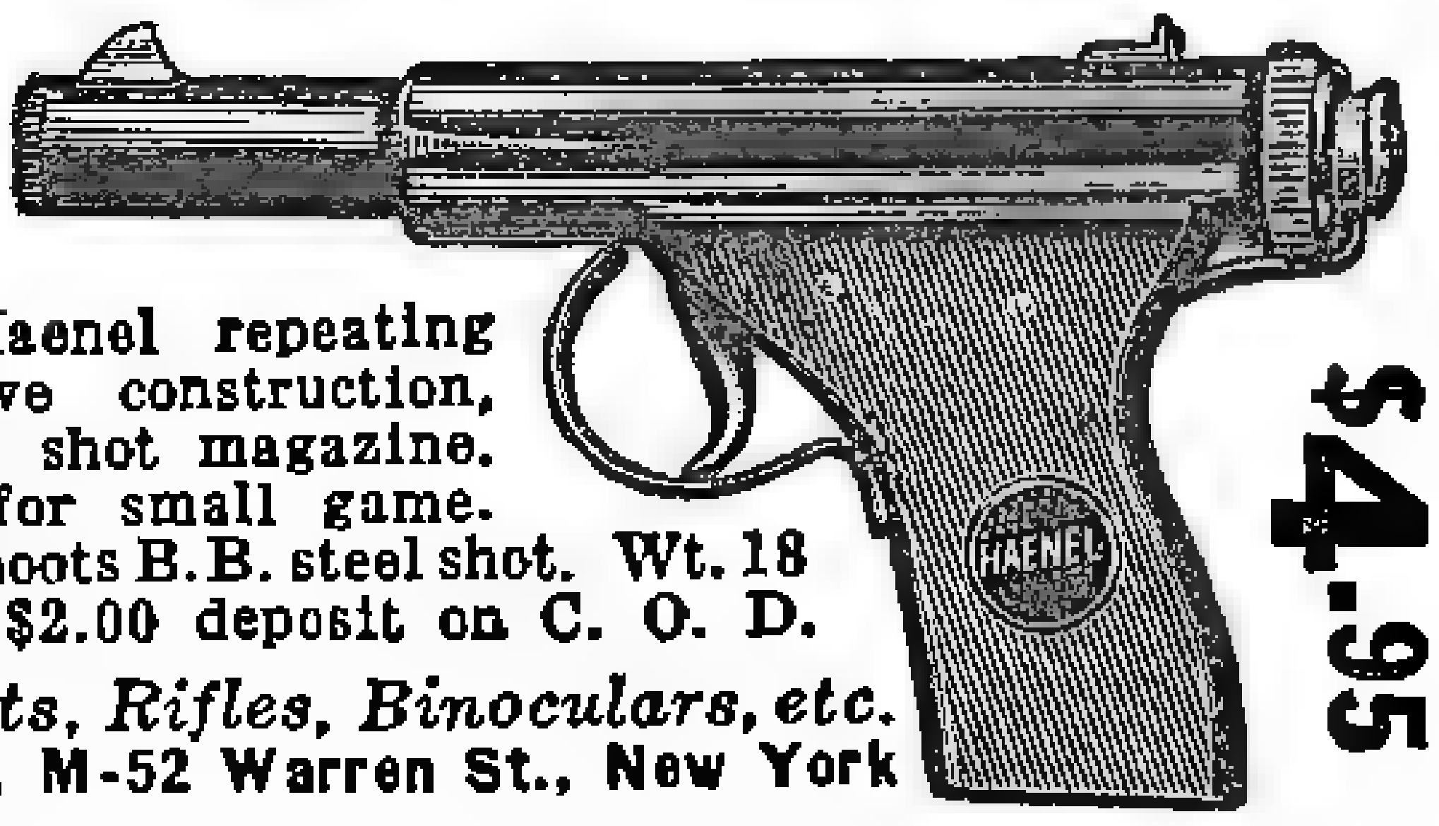

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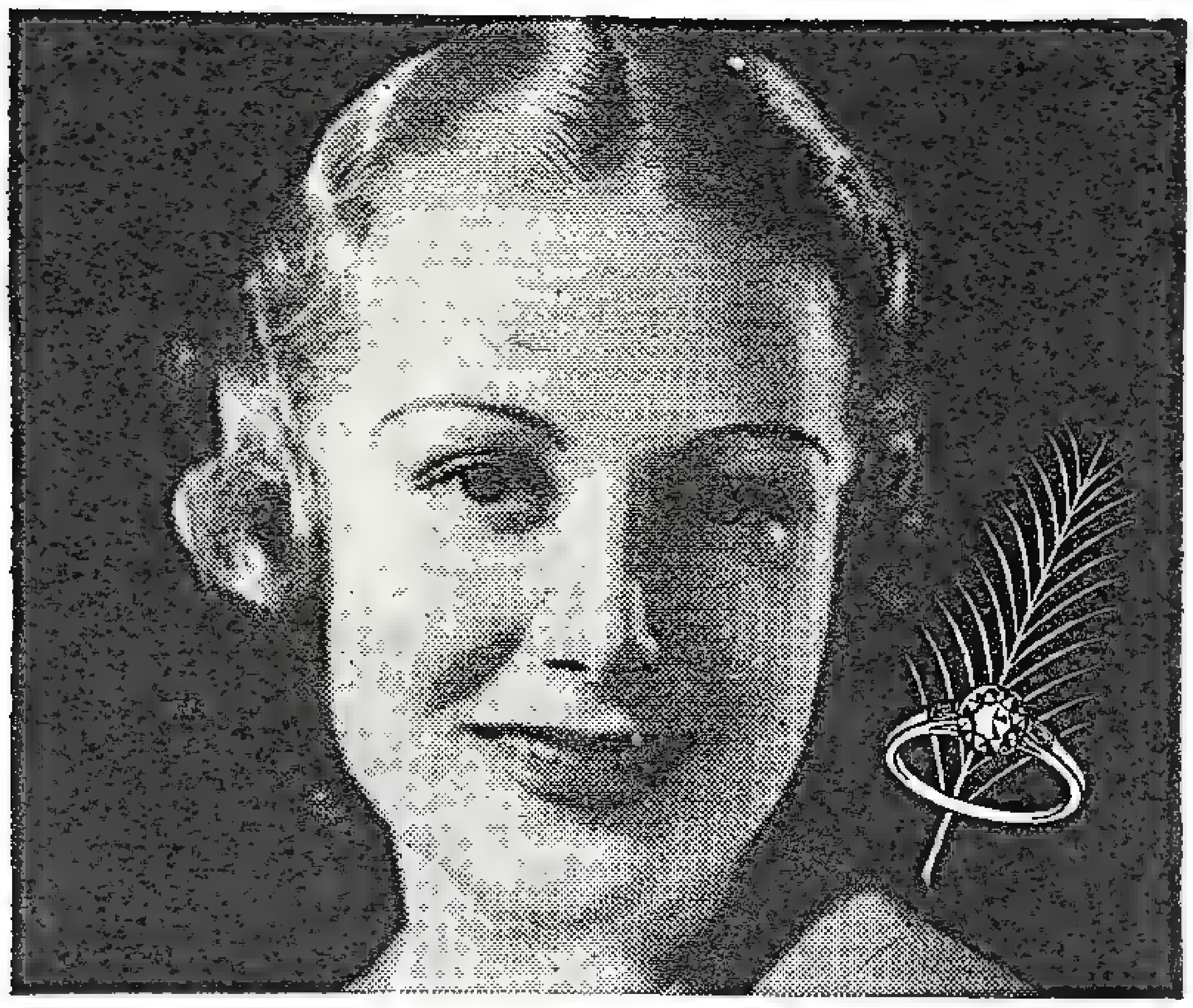

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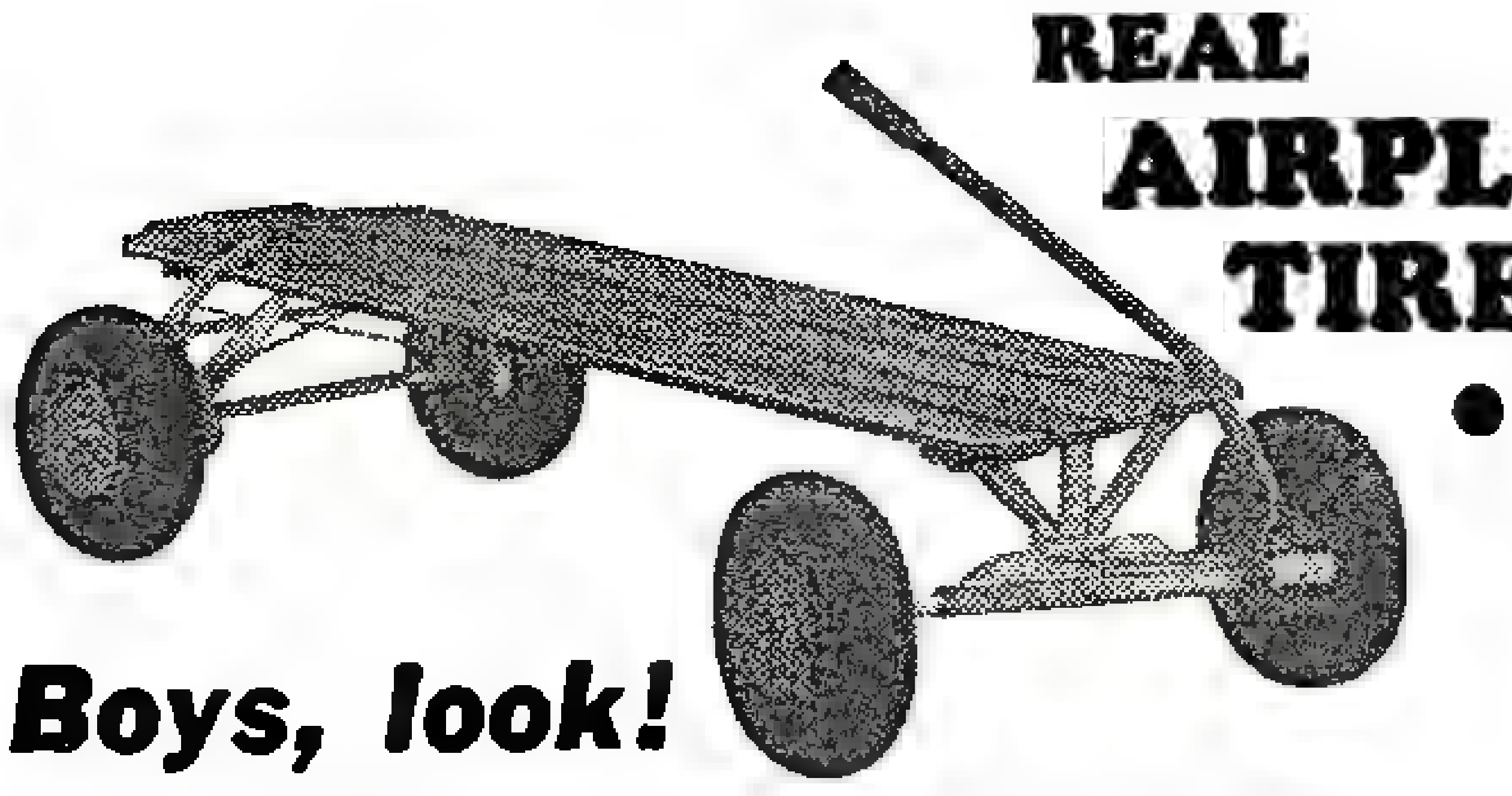

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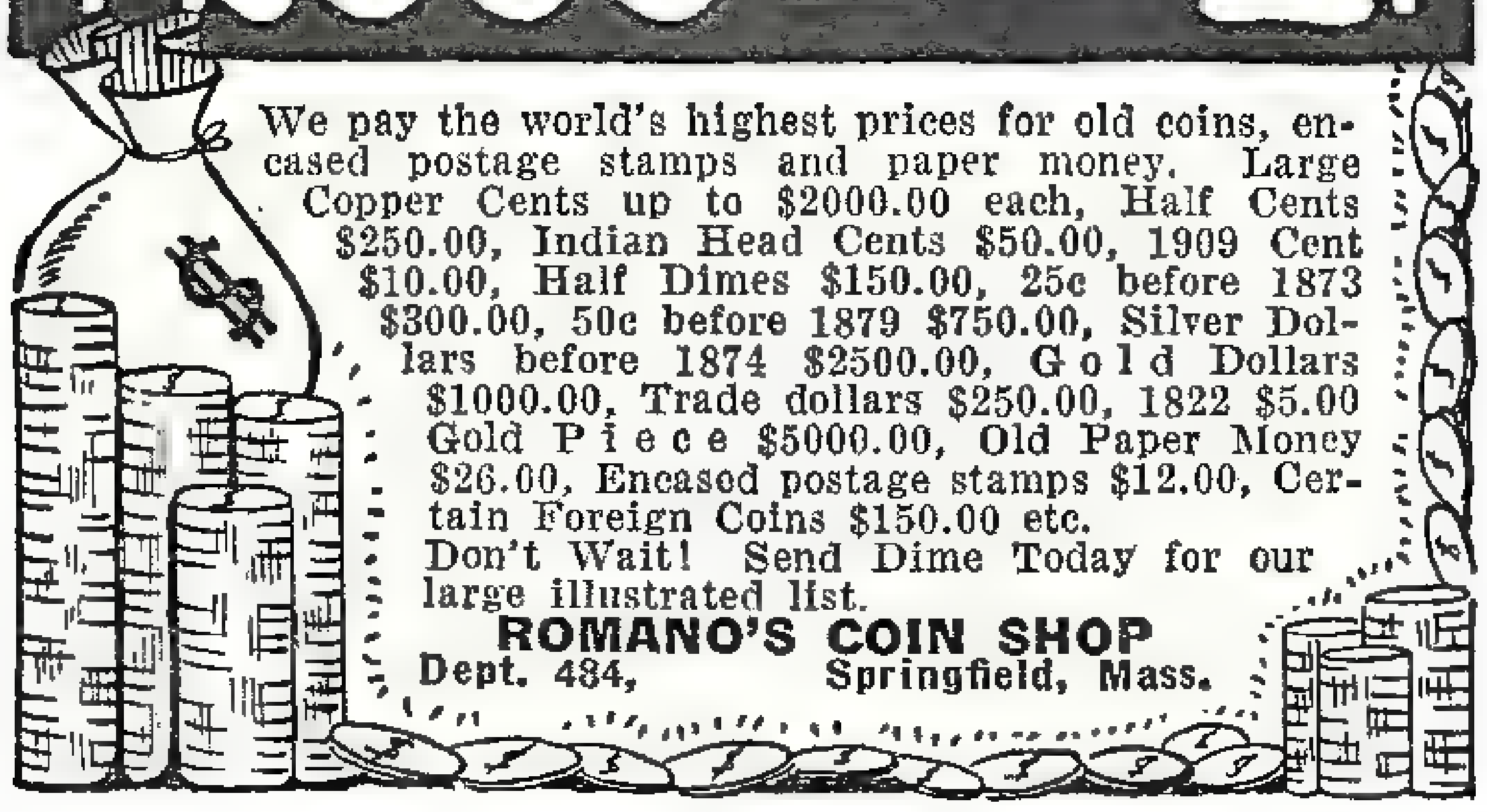

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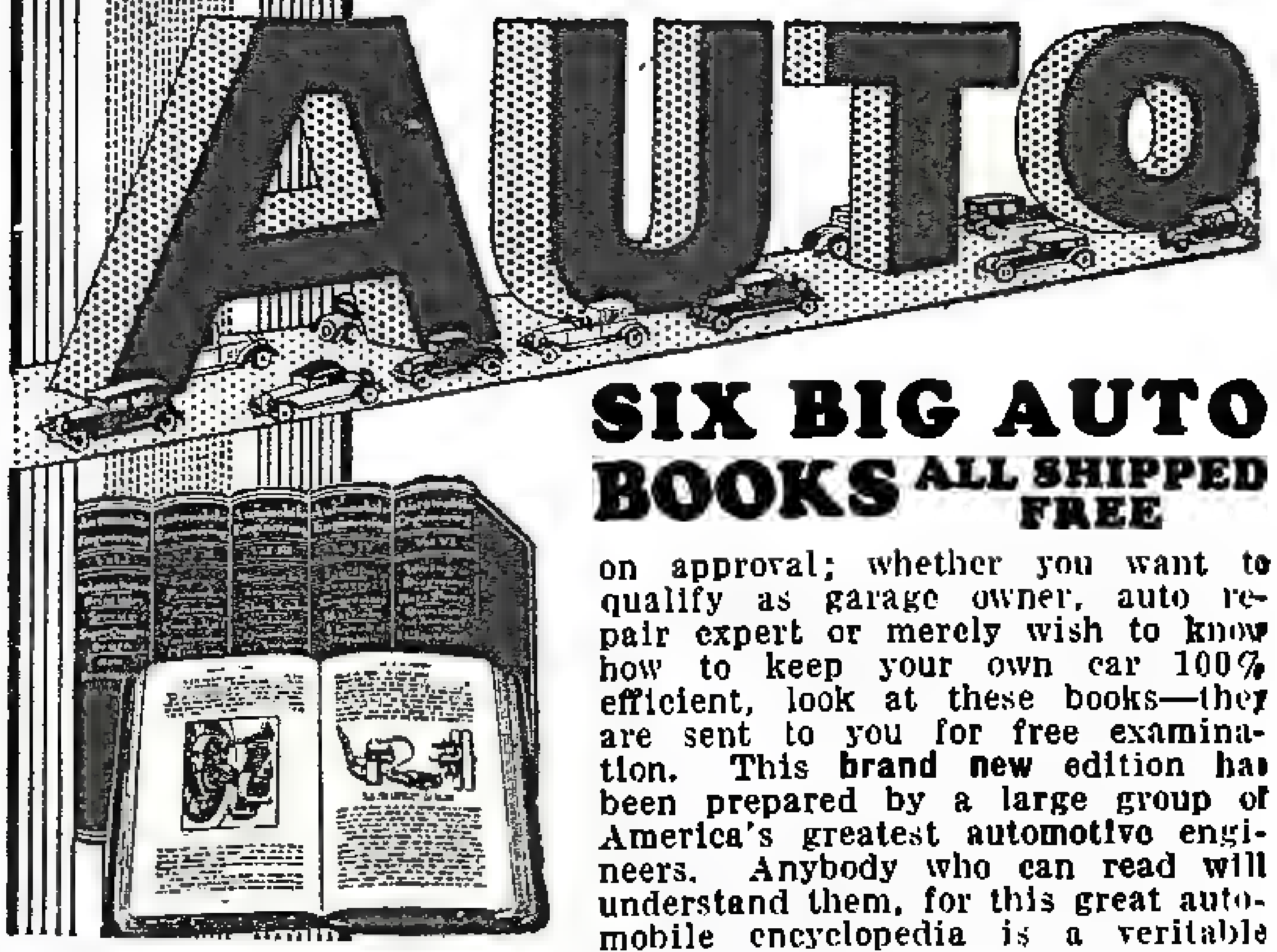

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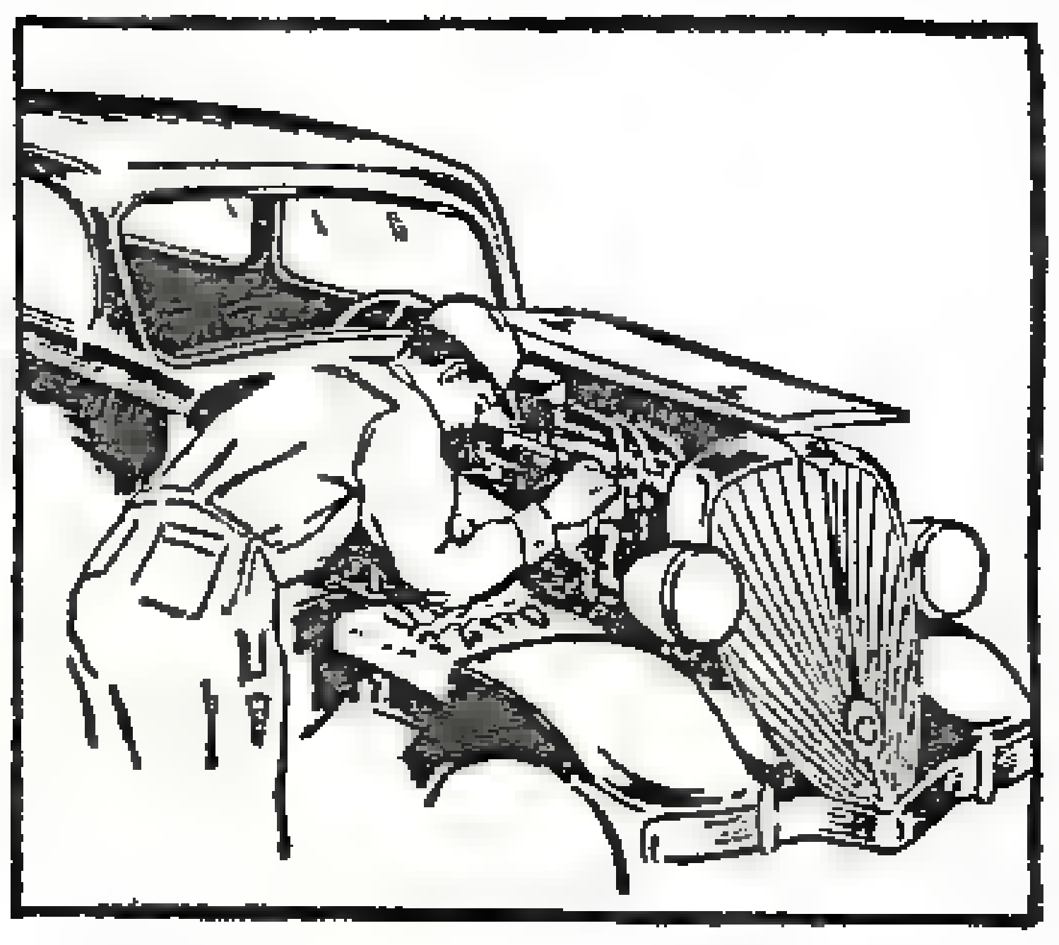

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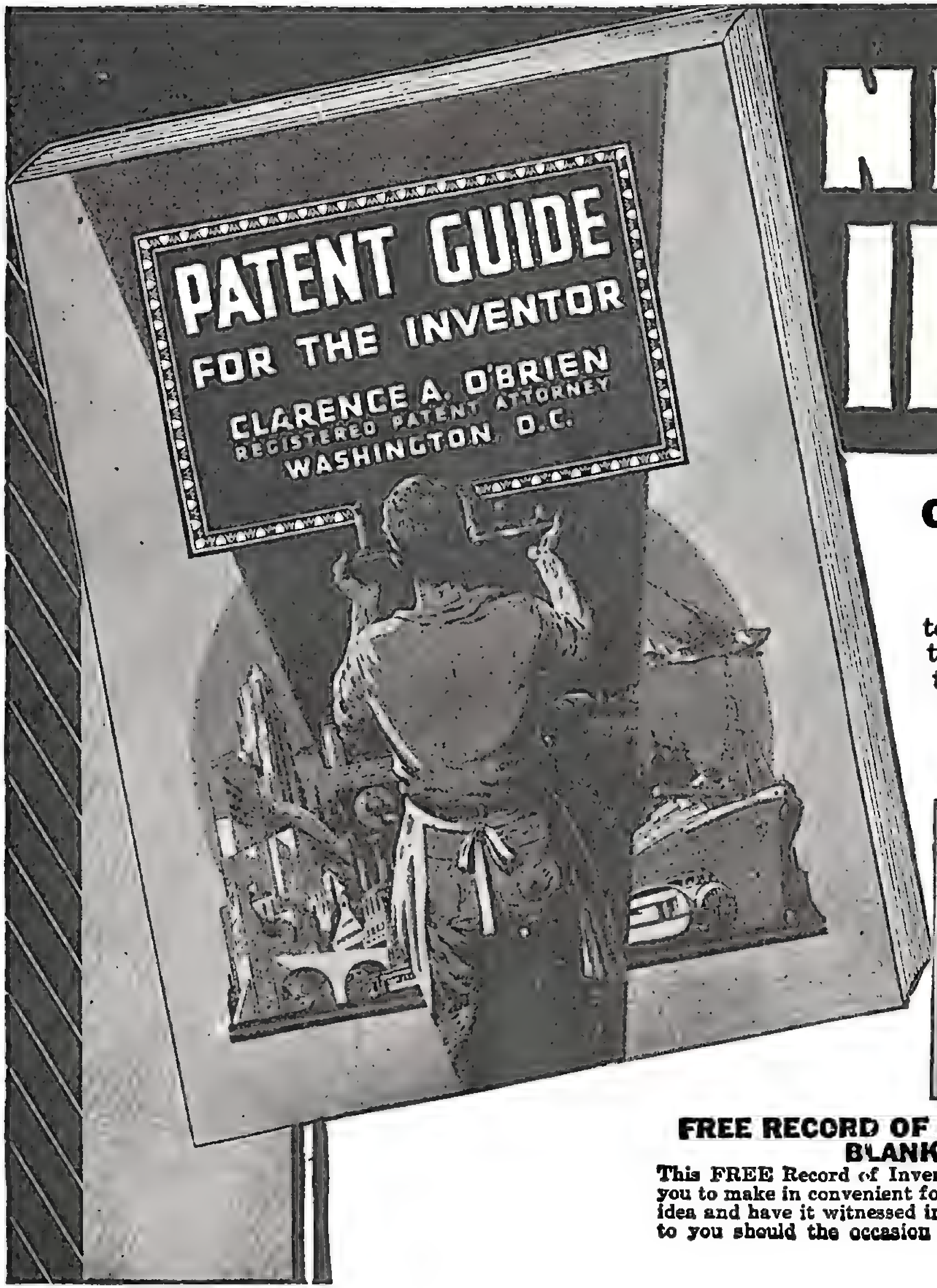

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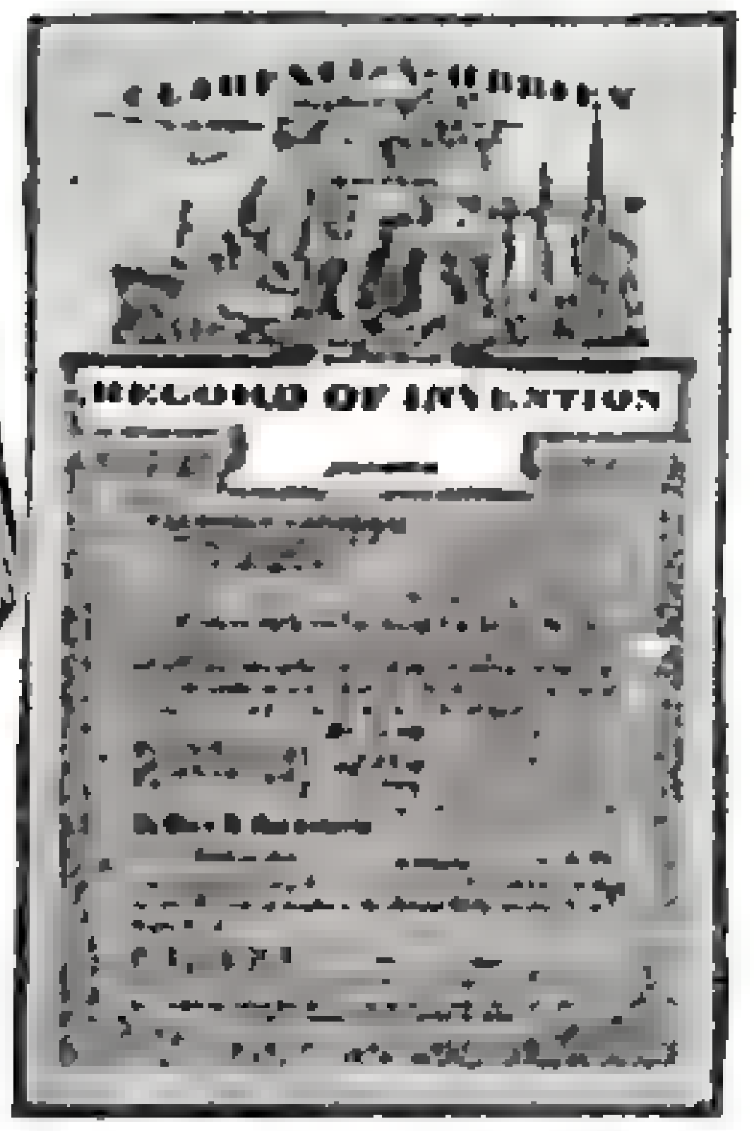

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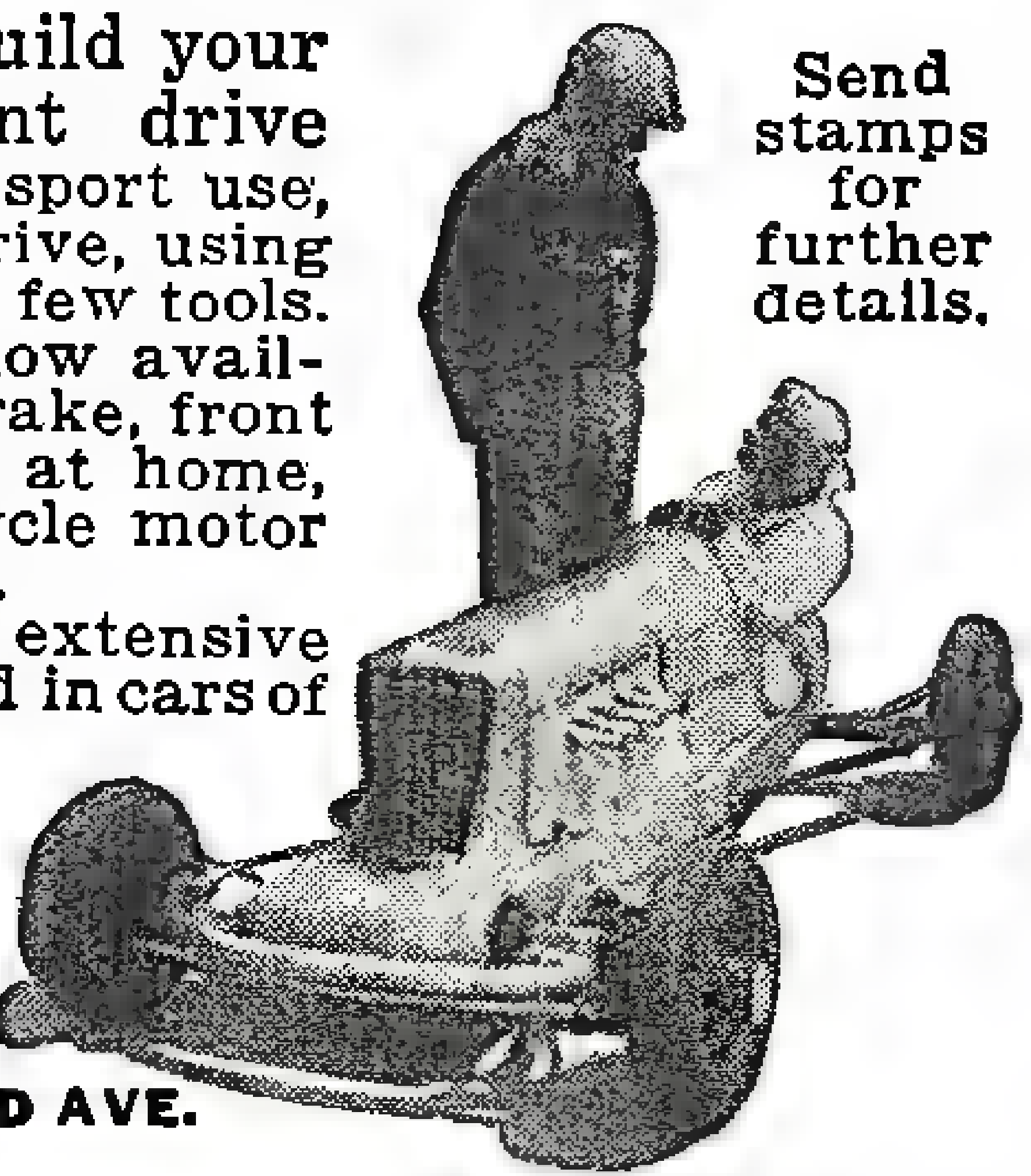

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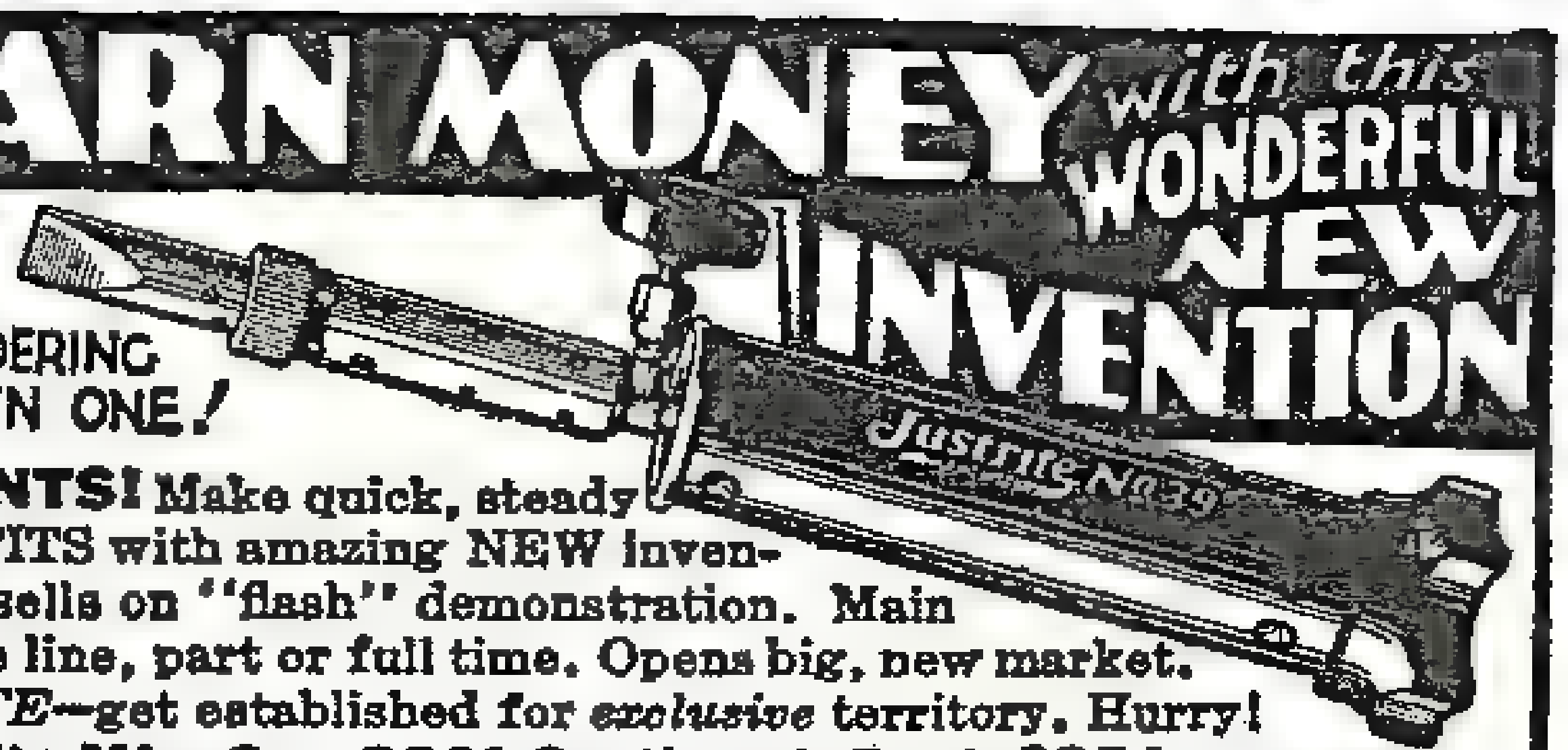

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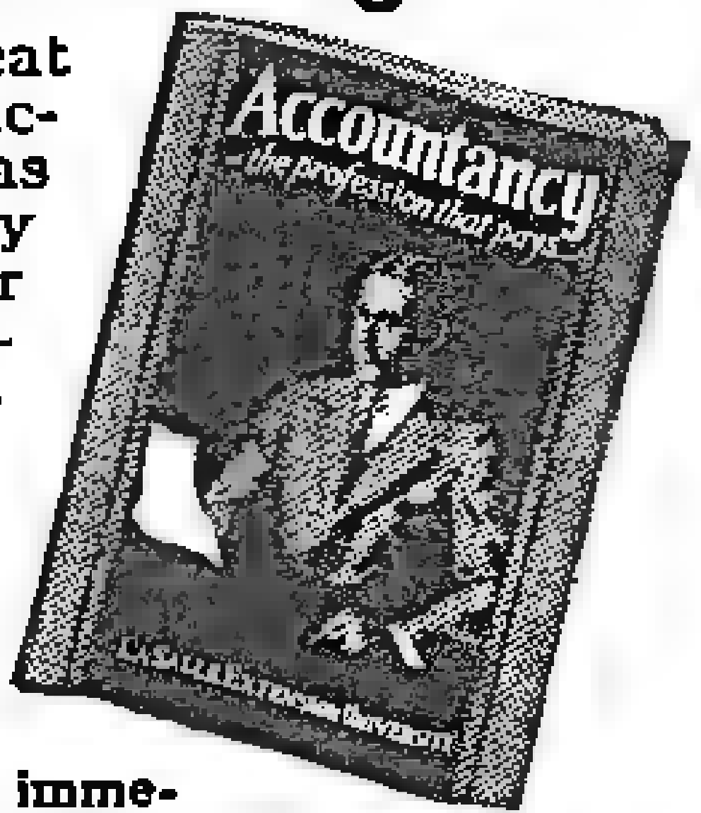

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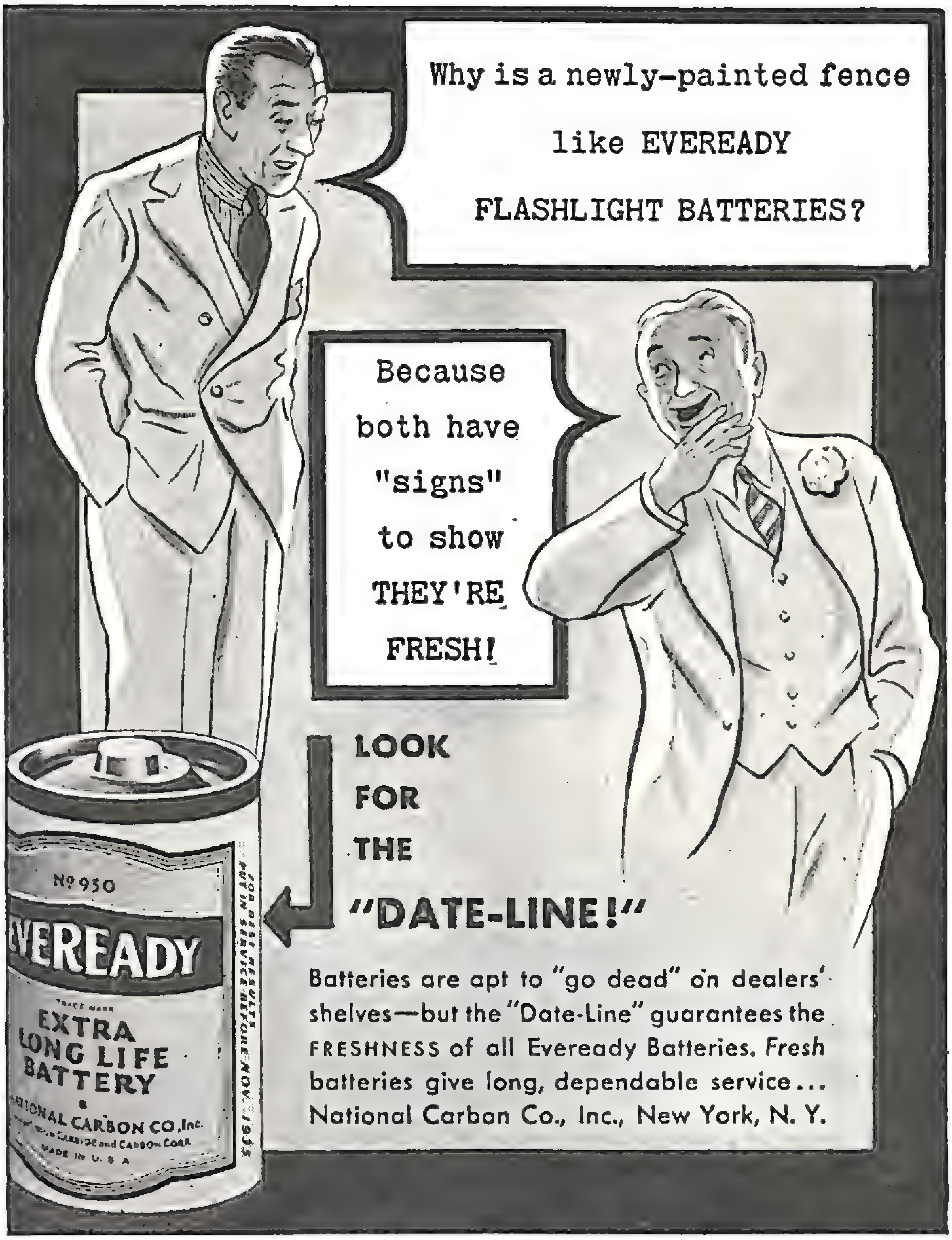
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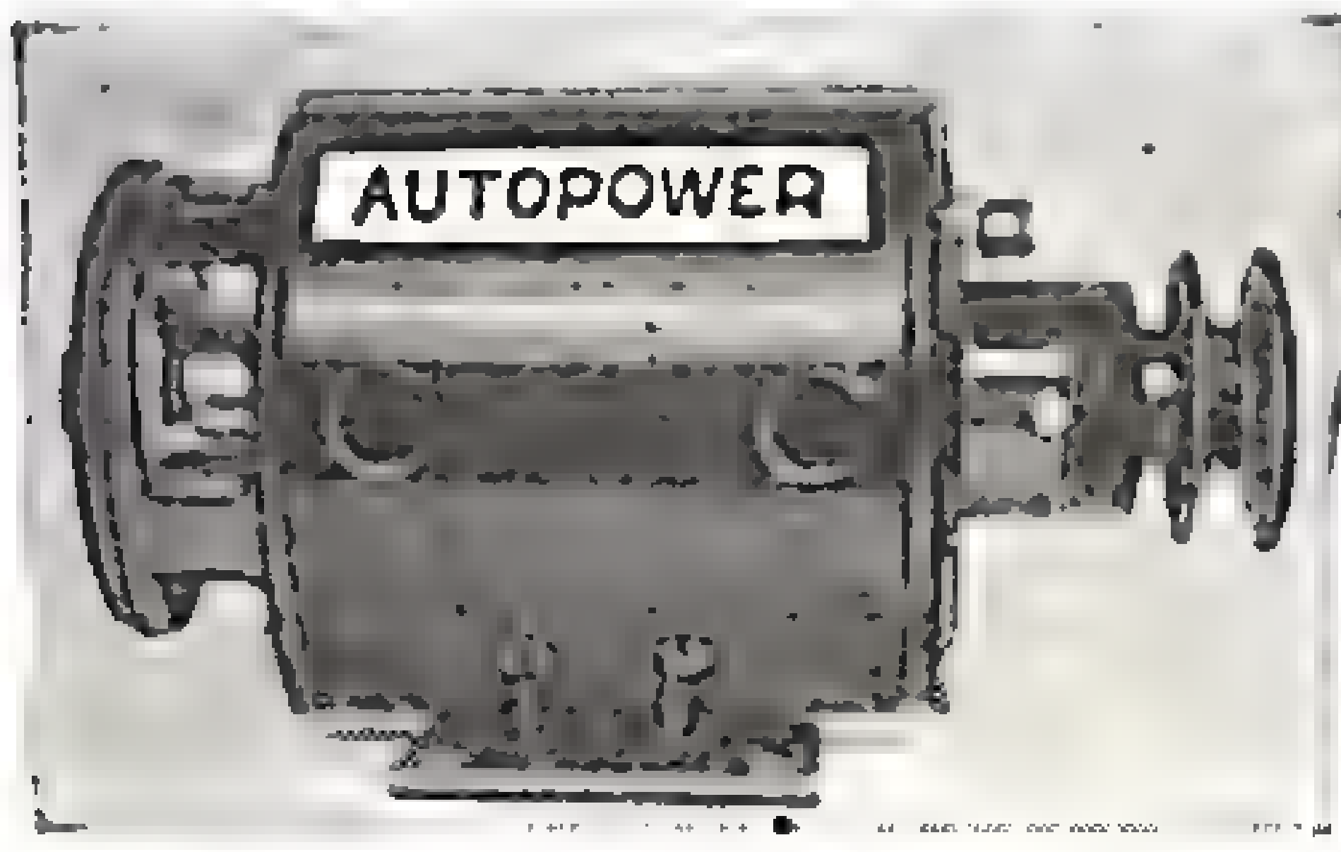

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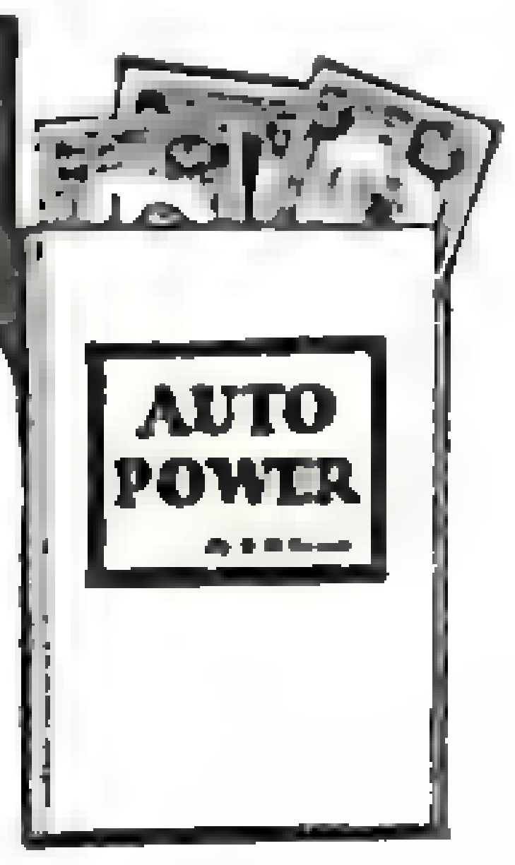

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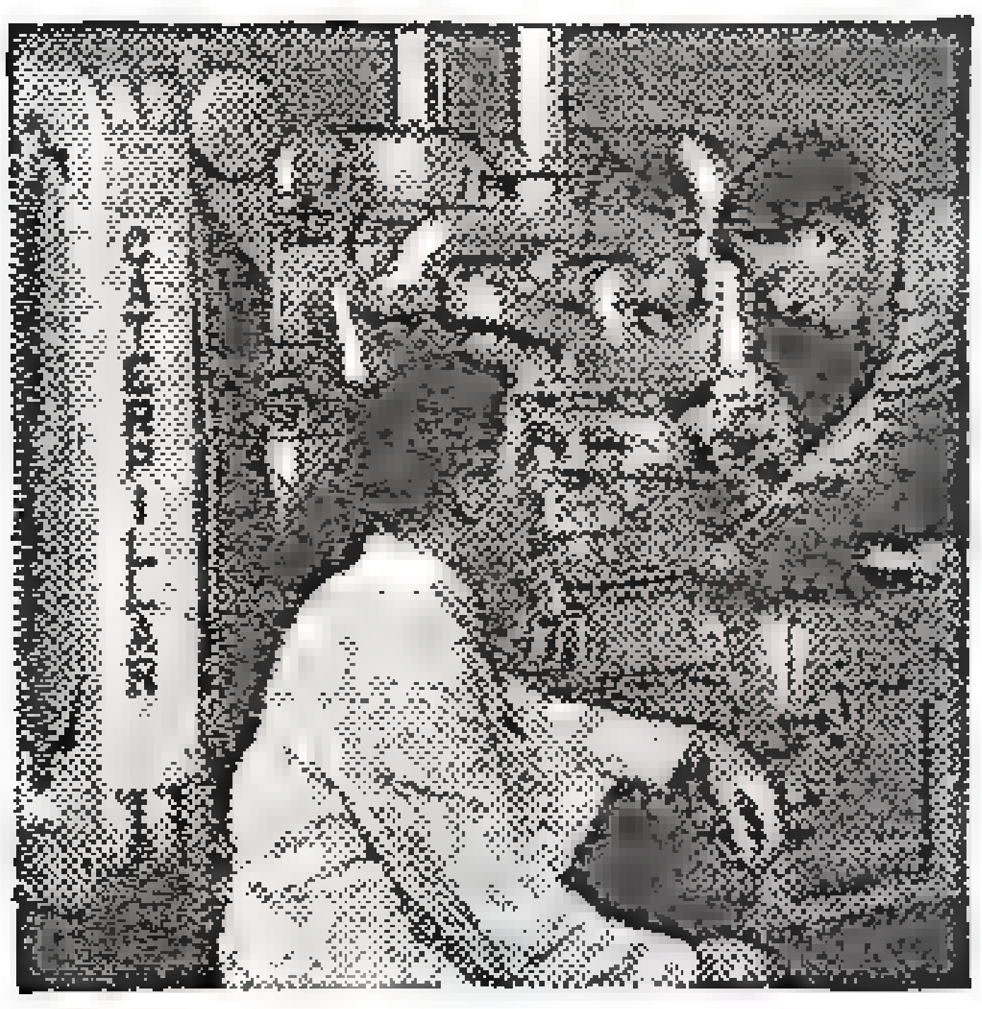

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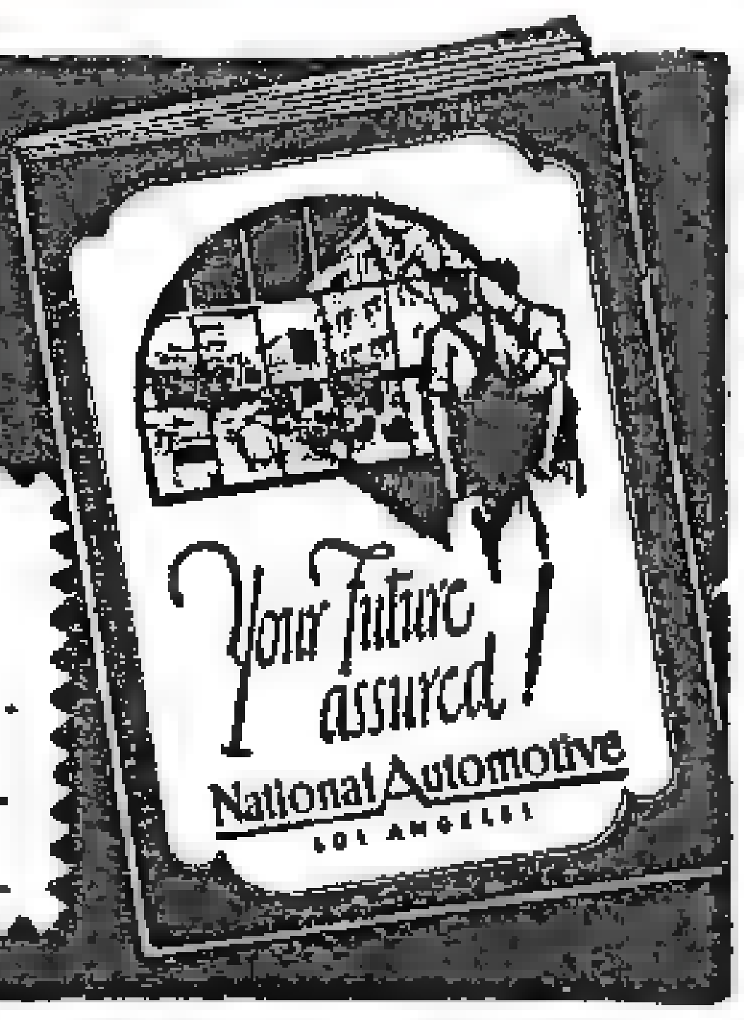

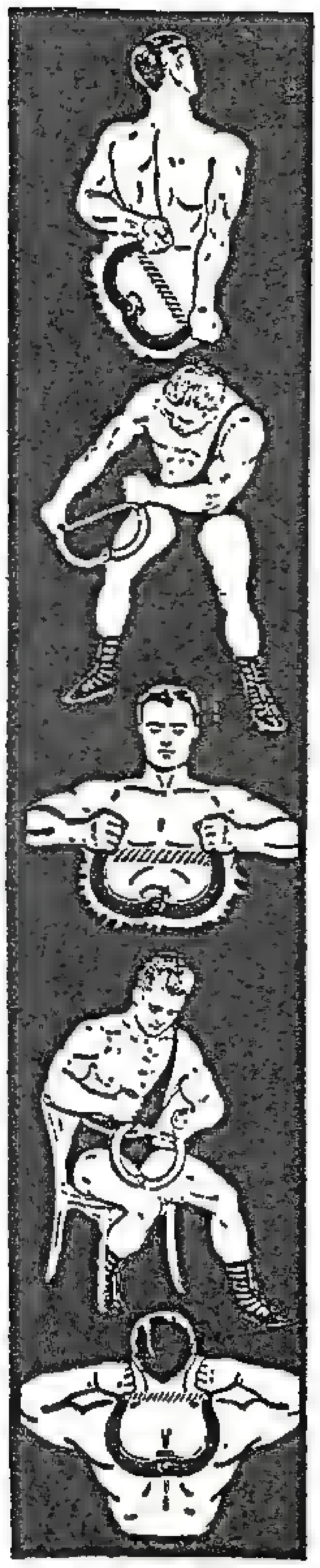

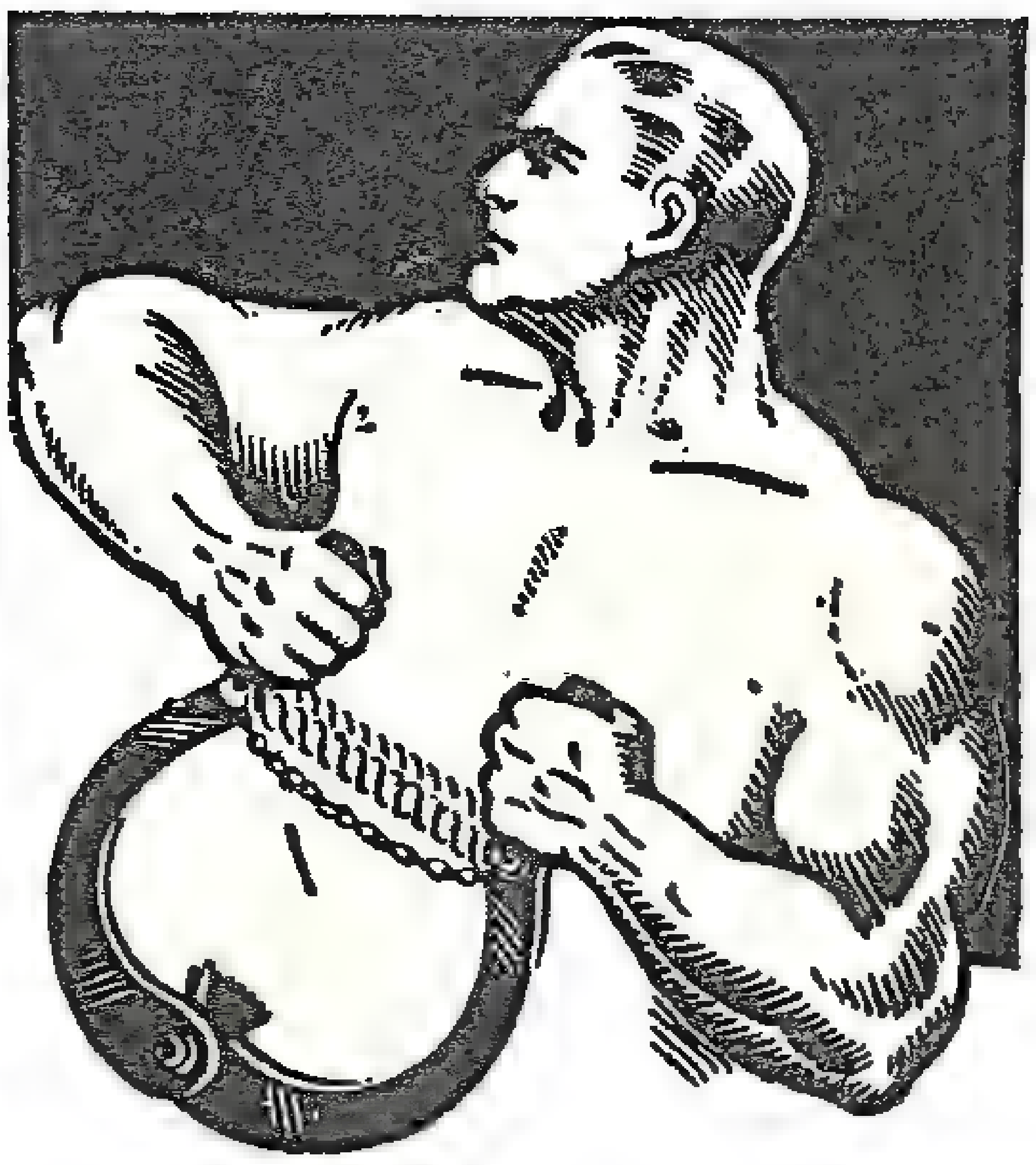

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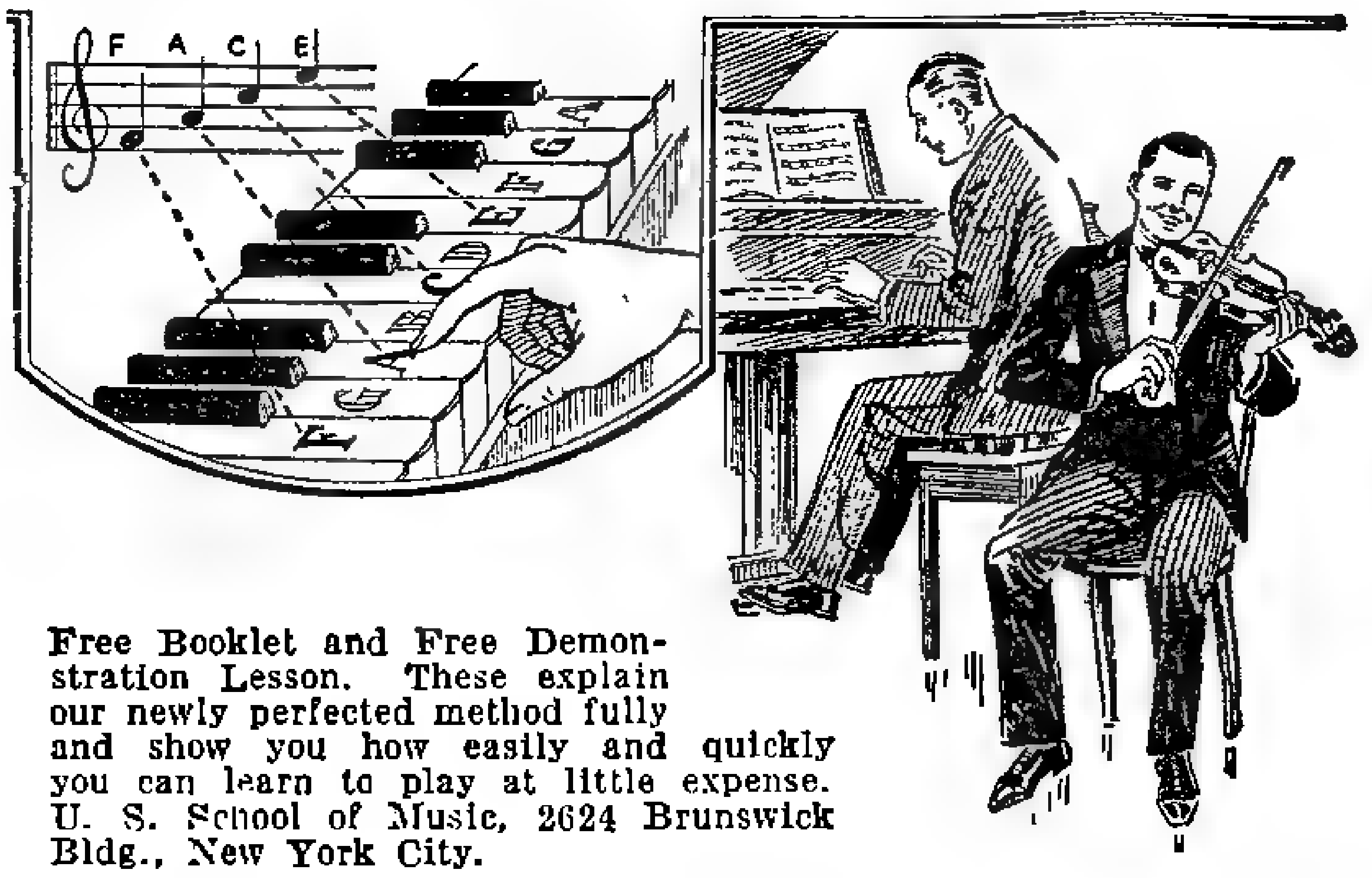

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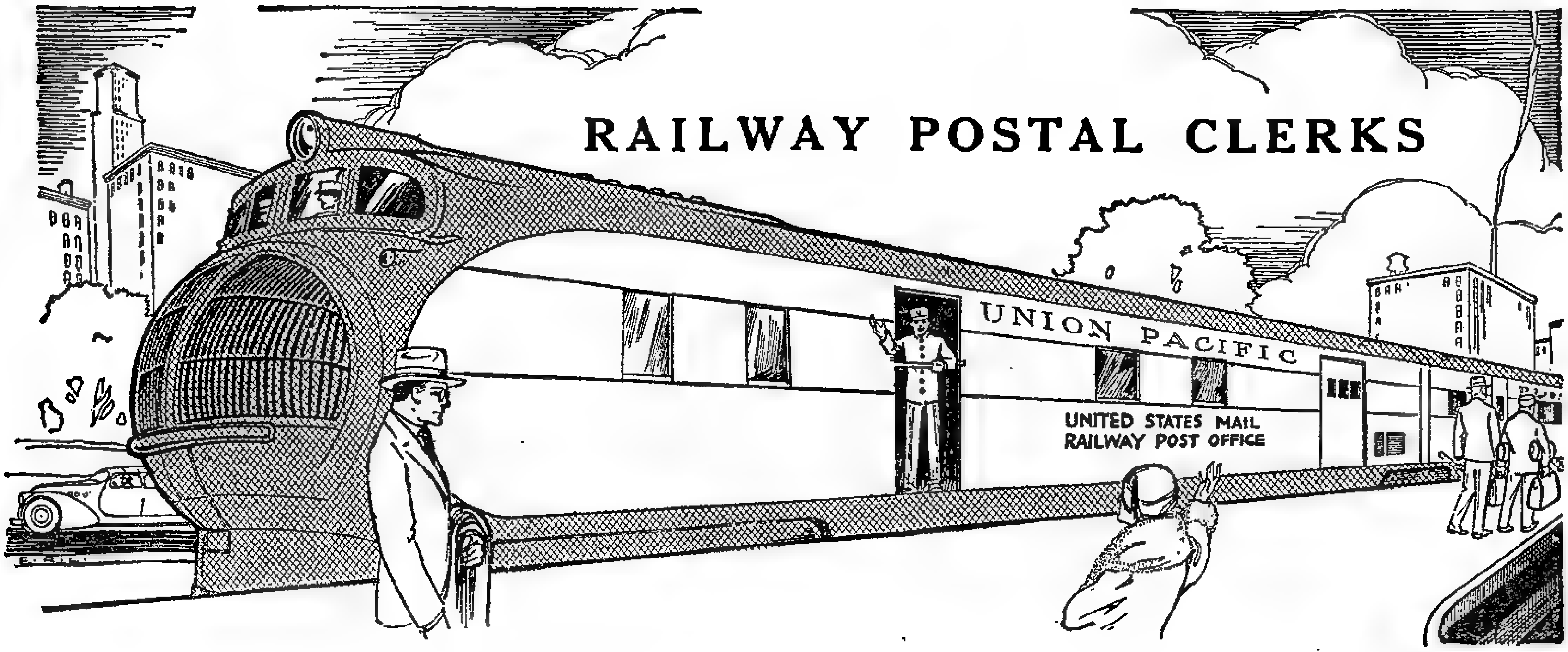

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Building

by
ALLAN LOCKHEED
Noted Plane Designer

This article on the strato-plane of the future tells how huge double-decked planes will speed through the rarefied air from coast to coast in six hours.

D-57
PONY BLIMP

Above—Allan Lockheed, designer of Lindbergh's "Tingmissartoq," of the monoplane with which Amelia Earhart conquered the Pacific, of Wiley Post's "Winnie Mae," and other famous planes, is also the author of this comprehensive article on building stratosphere air-liners. Right—The Lockheed "Scout," designed 16 years ago, compares favorably with planes of later development—testimony to the fact that the future in aviation can be predicted today with reasonable accuracy. The streamlined principles of the "Scout" will be further developed in strato-planes.

ALLAN LOCKHEED

Supplies the nation's premier flyers—Lindbergh, Earhart, Hawks, Post, Wilkins—with Lockheed planes for their record feats. This pioneer of early aviation, now active on design work for air transports of the immediate future, contributed many of the ships that today are burning up commercial airline schedules and cutting air mail time in half. Consequently the words of Allan Lockheed, today one of the outstanding individual technicians of aviation, are of more than usual significance when he deals with the problems of flying airplanes in the stratosphere. His story follows:

WHY fly in the stratosphere?

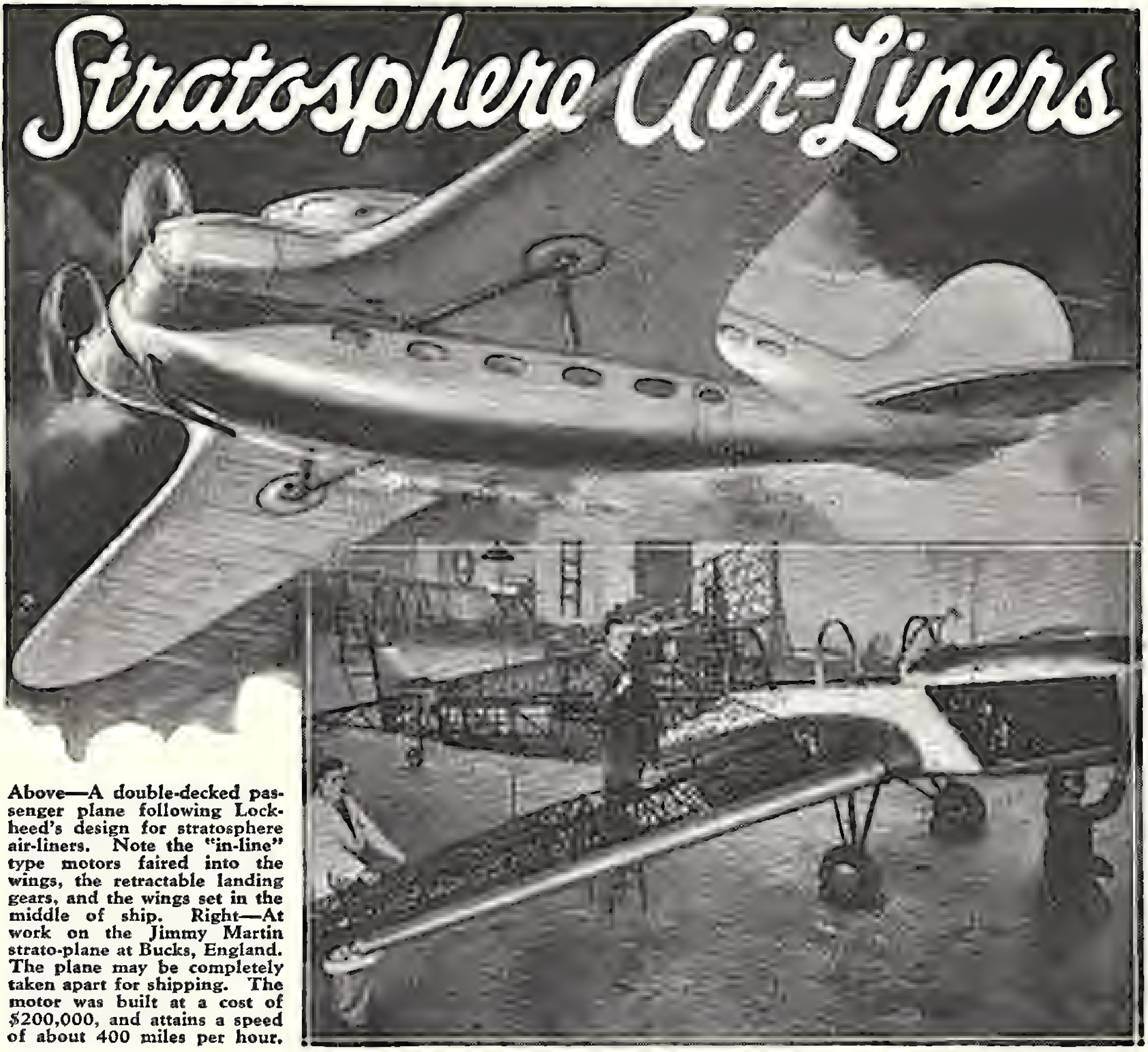
Simply because there's a free 200 mile an hour boost up there that aeronautical engineers want to take advantage of. If one could plan a railway that would run down hill all the way from coast to coast, think of the transcontinental speeds he could attain.

Flying in the stratosphere is not as simple as building a downhill railway, but it is a subject which has intrigued airplane designers for a long time. Much data has been accumulated about it. Many rumors have seeped through the daily press about the wonderful trans-oceanic speeds we are going to get. All that is in the offing.

Right this minute, however, enough material has been accumulated through pioneer experiments and flights to turn the minds of those of us who are engaged in the business of developing airplanes toward the possibility of building a stratosphere plane today. Under existing conditions, with existing materials, we plan to double our present speed by the simple expedient of welding this 200 mile an hour stratosphere boost to our cause.

Up in the stratosphere—that layer of air between 50,000 and 75,000 feet altitude—there are steady winds that blow from West to East, opposite the direction of the earth's rotation. By these winds alone we can gain a measureable increase in our overland speed. But there is another factor. As we ascend, the density of the air becomes less and less. This eventually diminishes to a point where we have gained the effect of reducing our fuselage and wing drag; which is the same as saying we have reduced our wing surface to the mini-

Stratosphere Air-Liners



Above—A double-decked passenger plane following Lockheed's design for stratosphere air-liners. Note the "in-line" type motors faired into the wings, the retractable landing gears, and the wings set in the middle of ship. **Right**—At work on the Jimmy Martin strato-plane at Bucks, England. The plane may be completely taken apart for shipping. The motor was built at a cost of $200,000, and attains a speed of about 400 miles per hour.

mum. At the same time, through supercharging or forcing air into the carburetor to increase performance, we have maintained our motor power output. The result is naturally a big jump in speed.

The only justification for stratosphere flight is velocity. If two points are so close together that an airplane could reach one point from another in less time than it would take to climb into the stratosphere, go the distance and descend, there will be no need for stratosphere lines. But the coast-to-coast route is a logical objective! Volume of traffic in paying quantities and the great time to be saved create a demand for such service.

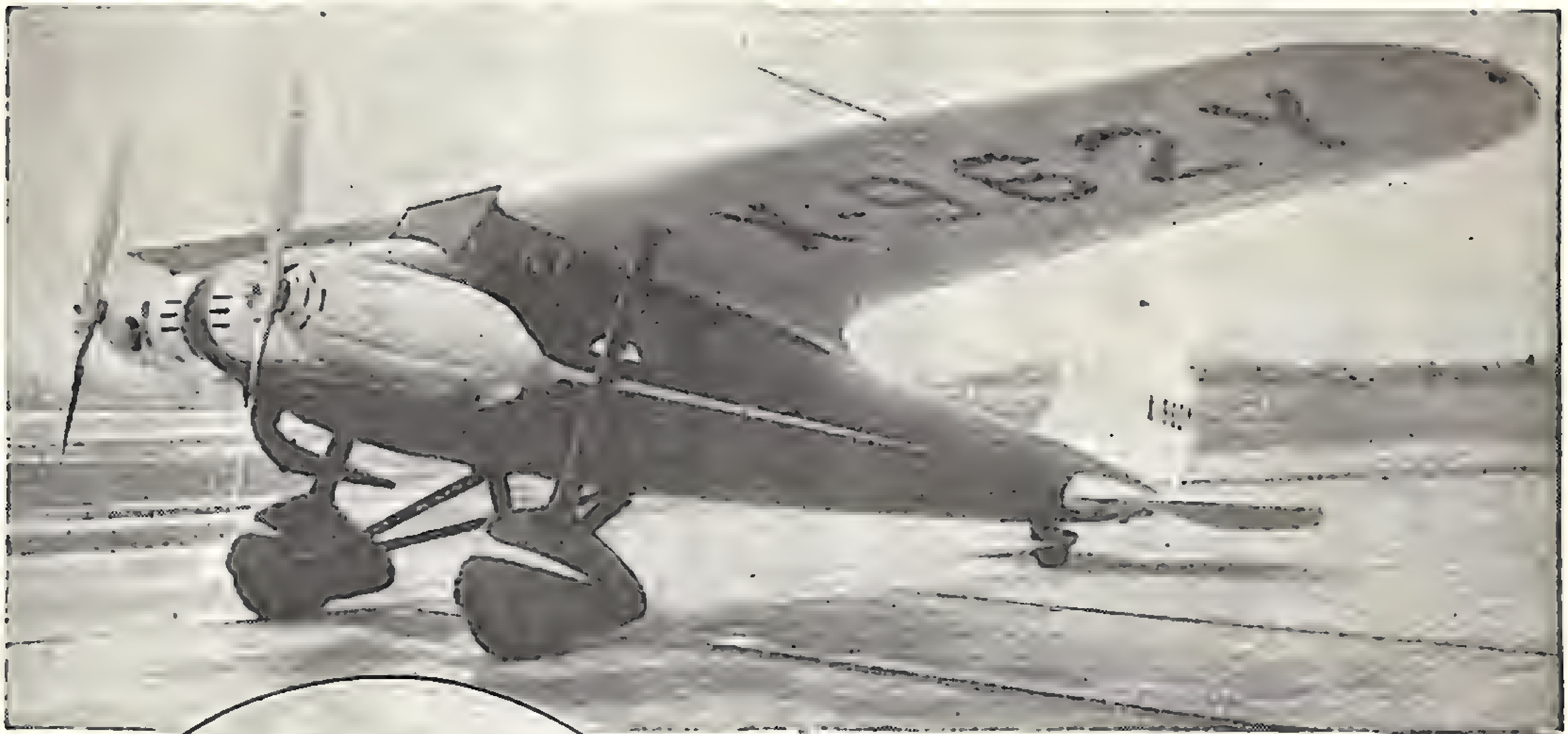
Since the eastern trip will take about 6 hours under top conditions, probably the airline men will loaf from Los Angeles to New York, taking 8 hours. Then by speeding the ship up against headwinds, they can maintain the same schedule going west to the coast. Here it will be a matter of psychology in balancing public feeling so that the traffic will be as heavy one way as the other.

But I'm getting a bit ahead of myself. I talk just as though the stratosphere airliner were an accomplished fact. To me it is—I've carried all the probabilities around in my mind's eye until I can recite them backwards. Cleopatra could have had an automobile, you know. At that time all the materials existed which were necessary for the construction of the car. We can have a stratosphere plane if we want it; and we know how to build it and what it will look like.

I'll tell you what the plane will look like, and why it will be constructed the way it will.

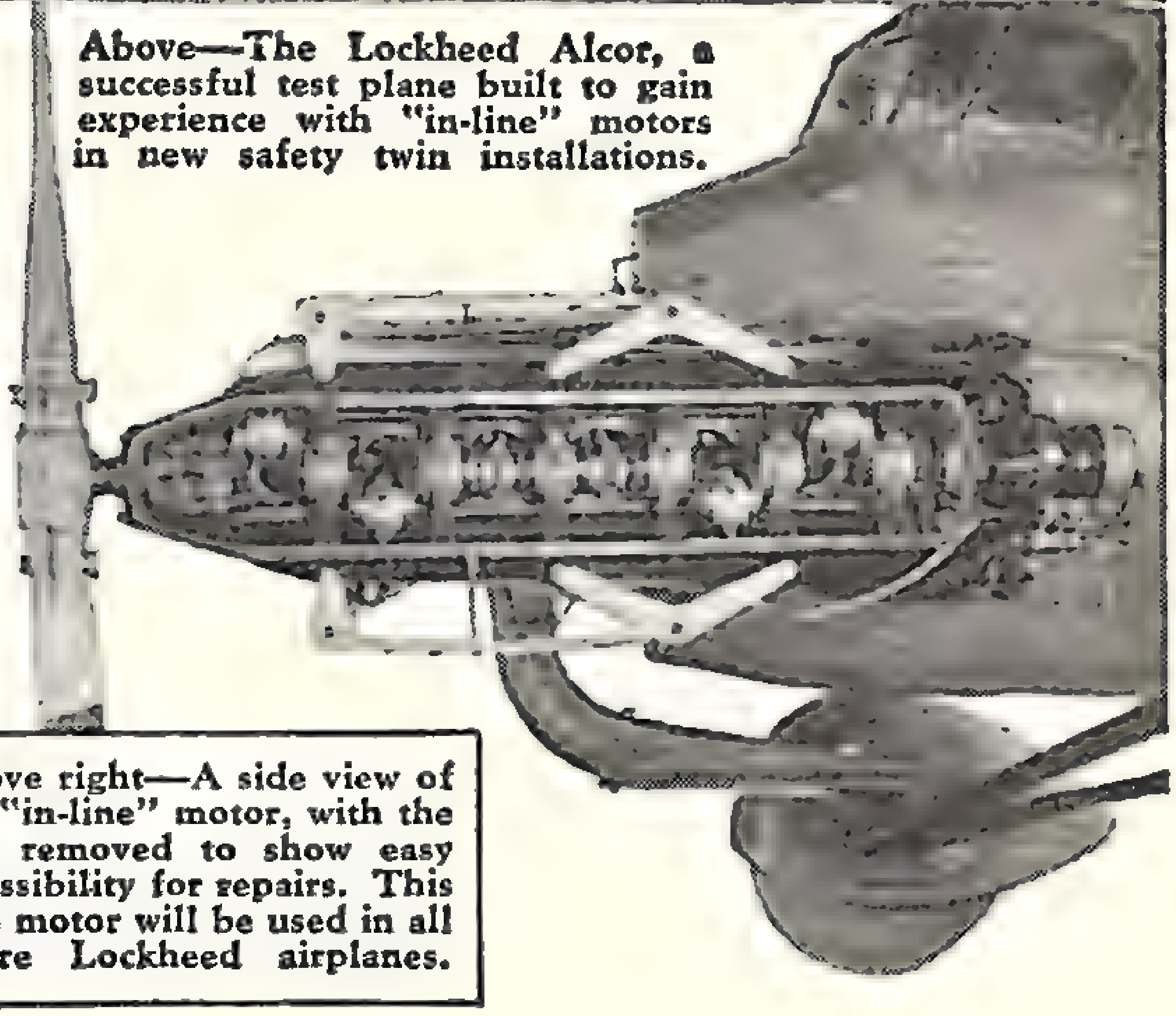
Confidence in this prediction is based on the fact that my early ideas have stood the test of time. Some of the designs I did ten and twelve years ago, radical at the time, can

"In Line" Type Safety Motors Will Feature New Stratosphere Planes

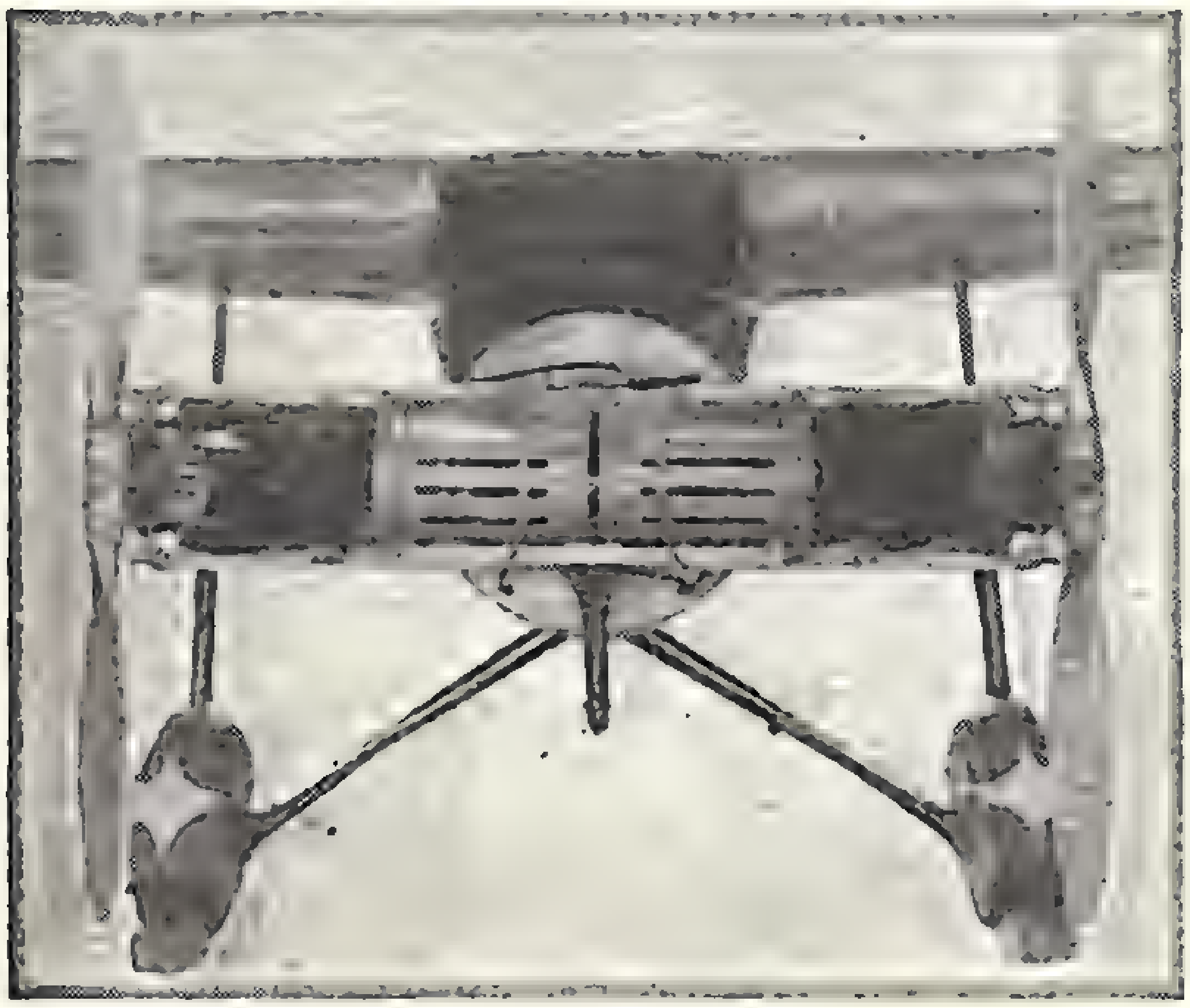


Above—The Lockheed Alcor, a successful test plane built to gain experience with "in-line" motors in new safety twin installations.

The motors of the new Lockheed plane are so close together that the failure of one would not cause pilot to lose control.



Above right—A side view of the "in-line" motor, with the pan removed to show easy accessibility for repairs. This type motor will be used in all future Lockheed airplanes.



Above—A front view of the Alcor's motors showing how they afford better vision for the pilot while making a landing.

now hold their own with ships of conventional 1934 design. Working closely with aviation problems, things I have seen at an early date have later come to pass with considerable accuracy.

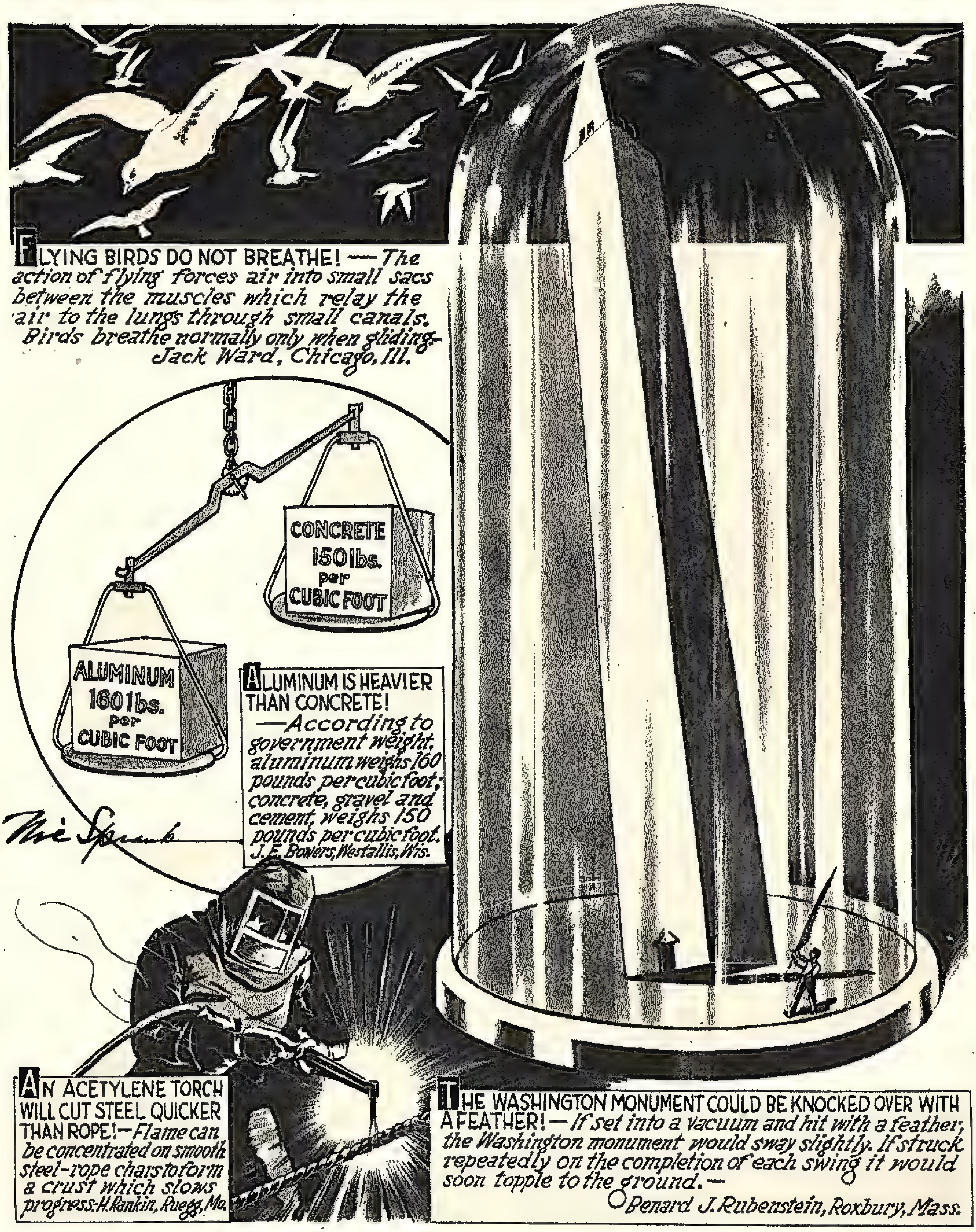
In 1918 I designed the Scout. The little Scout had a monocoque fuselage, streamlined to perfection. Today, 16 years later, the Scout would hold its own though stacked up against a modern ship on any tarmac.

In 1926 I organized the Lockheed Aircraft Corporation. The fuselage construction used in the Scout—the plywood monocoque—was improved upon in detail but not in principle, and we commenced manufacture of the Lockheed Vega.

This ship did big things. It was aerodynamically clean, a fact which can be attributed to the idea of building the plywood fuselage

[*Continued on page* 140]

Knock Down Monuments With Feathers
Nic Sprank in ODDITIES of Science



FLYING BIRDS DO NOT BREATHE!—*The action of flying forces air into small sacs between the muscles which relay the air to the lungs through small canals. Birds breathe normally only when gliding.*—Jack Ward, Chicago, Ill.

ALUMINUM IS HEAVIER THAN CONCRETE!—*According to government weight, aluminum weighs 160 pounds per cubic foot; concrete, gravel and cement, weighs 150 pounds per cubic foot.* J. E. Bowers, Westallis, Wis.

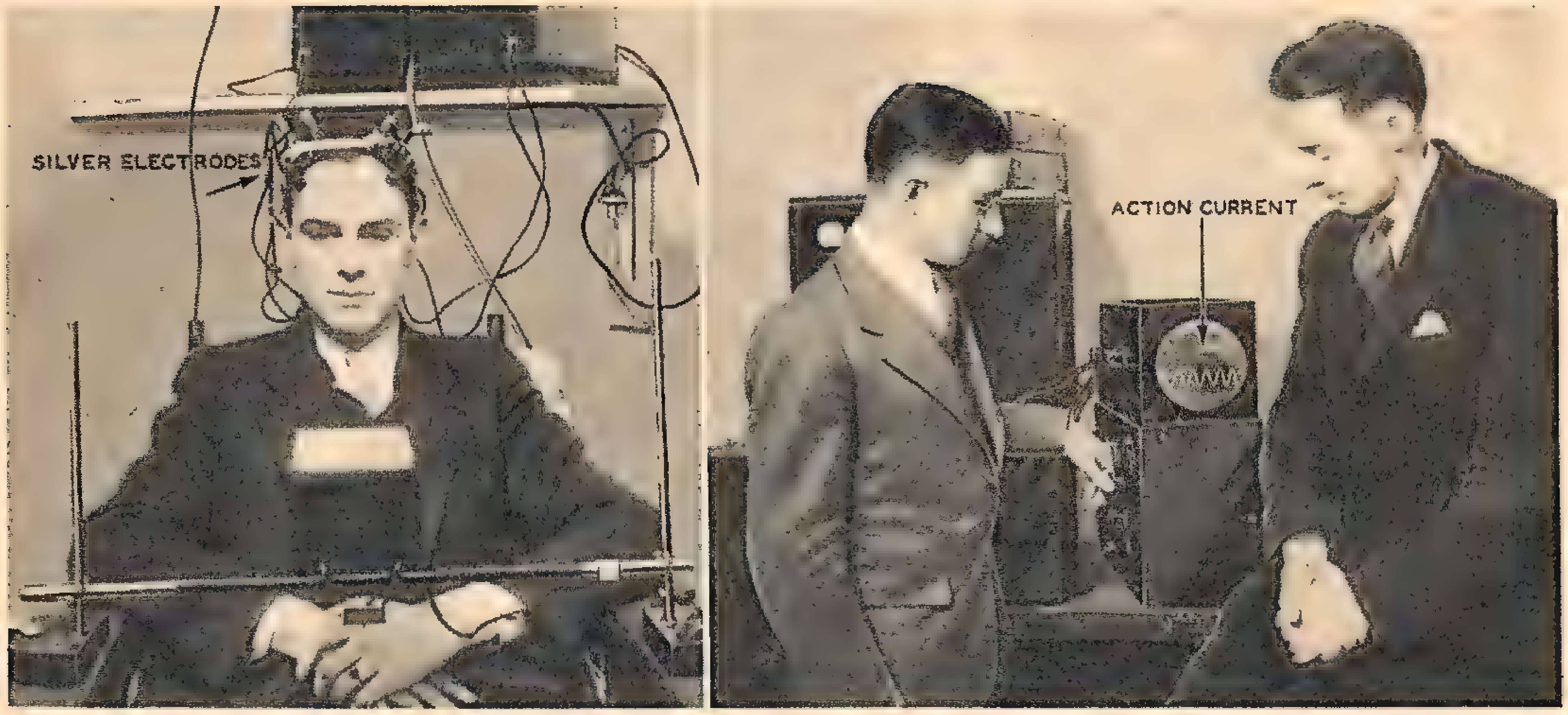
AN ACETYLENE TORCH WILL CUT STEEL QUICKER THAN ROPE!—*Flame can be concentrated on smooth steel-rope chars to form a crust which slows progress.*-H. Rankin, Ruegg, Mo.

THE WASHINGTON MONUMENT COULD BE KNOCKED OVER WITH A FEATHER!—*If set into a vacuum and hit with a feather, the Washington monument would sway slightly. If struck repeatedly on the completion of each swing it would soon topple to the ground.*—

Benard J. Rubenstein, Roxbury, Mass.

Win $1! Send your Oddity of Science to Nic Sprank, Modern Mechanix and Inventions, 529 South 7th Street, Minneapolis. Source or proof of each oddity must be given. Send all oddities separately, not with other manuscripts or letters.

Scientists Invent Machine To Discover How Brain Works

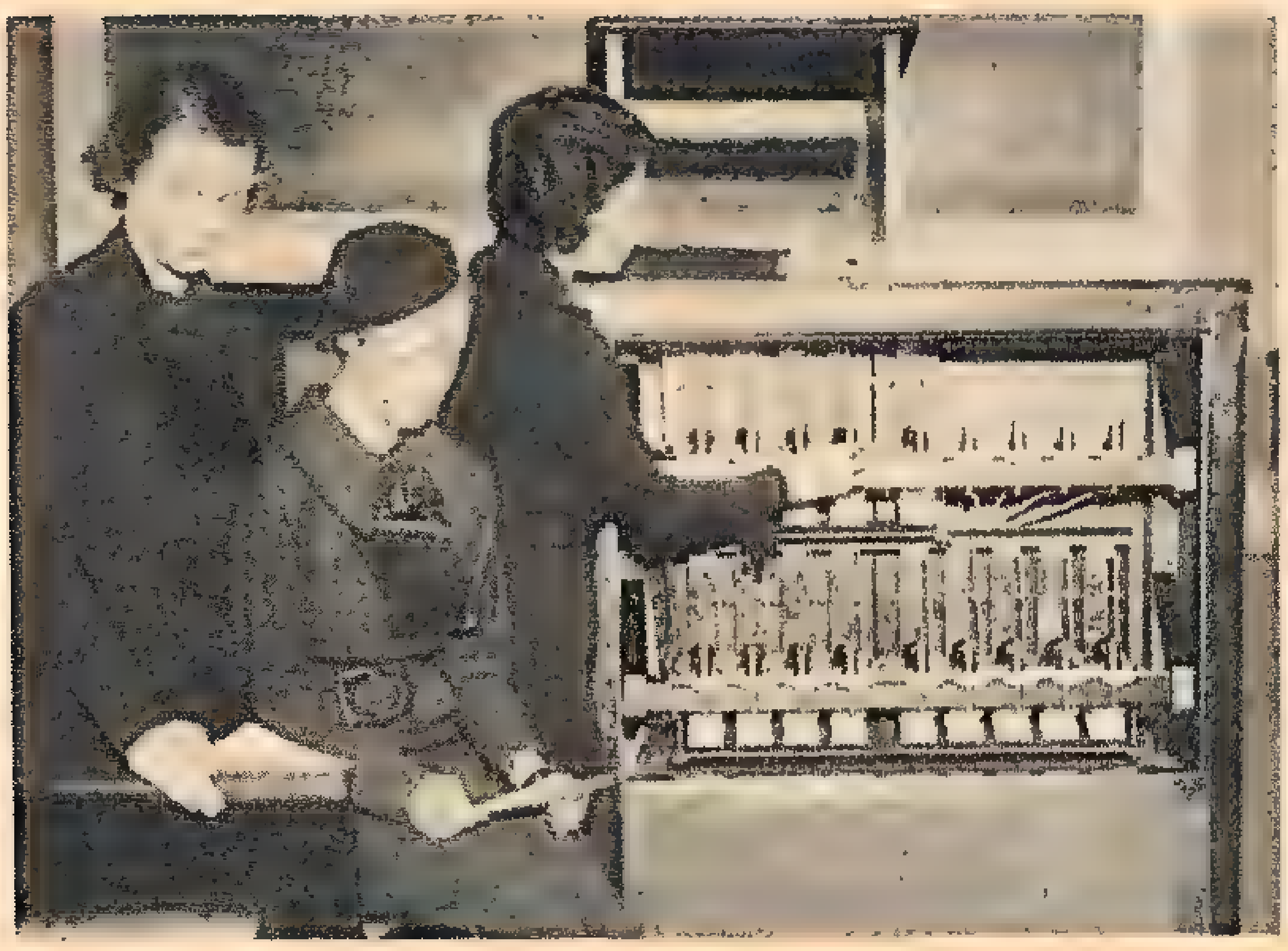


Left—A headpiece containing silver electrodes is clamped on the patient's head to pick up the brain's electrical currents. Right—The inventors of the machine watch the action of the amplified "action current" as it flows swiftly across the disc.

THE brain, perhaps the most mystifying organ of the human body, can now be scientifically studied by a new apparatus which photographs amplified "action currents." Invented by Dr. H. H. Jasper and Dr. L. Carmichael of Brown University, the new machine will permit physicians to study the action of the brain just as the electrocardiograph permits a revealing study of heart action.

A headpiece on the head of the patient picks up electric currents of about one ten-millionths of a volt which flow from the brain in waves, at a rate of from eight to fifty per second. The currents are carried to an amplifying box where they are intensified 500,000 times and flashed across a glass disc. The ordinary currents are smooth and wavy; when the mind is disturbed, they are sharp and irregular.

Device Measures Musical Talent



The automatic tone variator (above) has 14 tuning-forks, each delicately tuned to one-quarter of a tone from the other.

A YARDSTICK for the measurement of musical talent, an automatic tone-variator, is now being used at Northwestern University to determine students' ability to determine exact tonal pitch.

The machine contains 14 tuning-forks, set within one-quarter tone of each other. Two notes are struck in quick succession, and the students are asked which note was higher. Those that can detect the higher note consistently are keenly encouraged to study music. They are considered to be musically apt and talented.

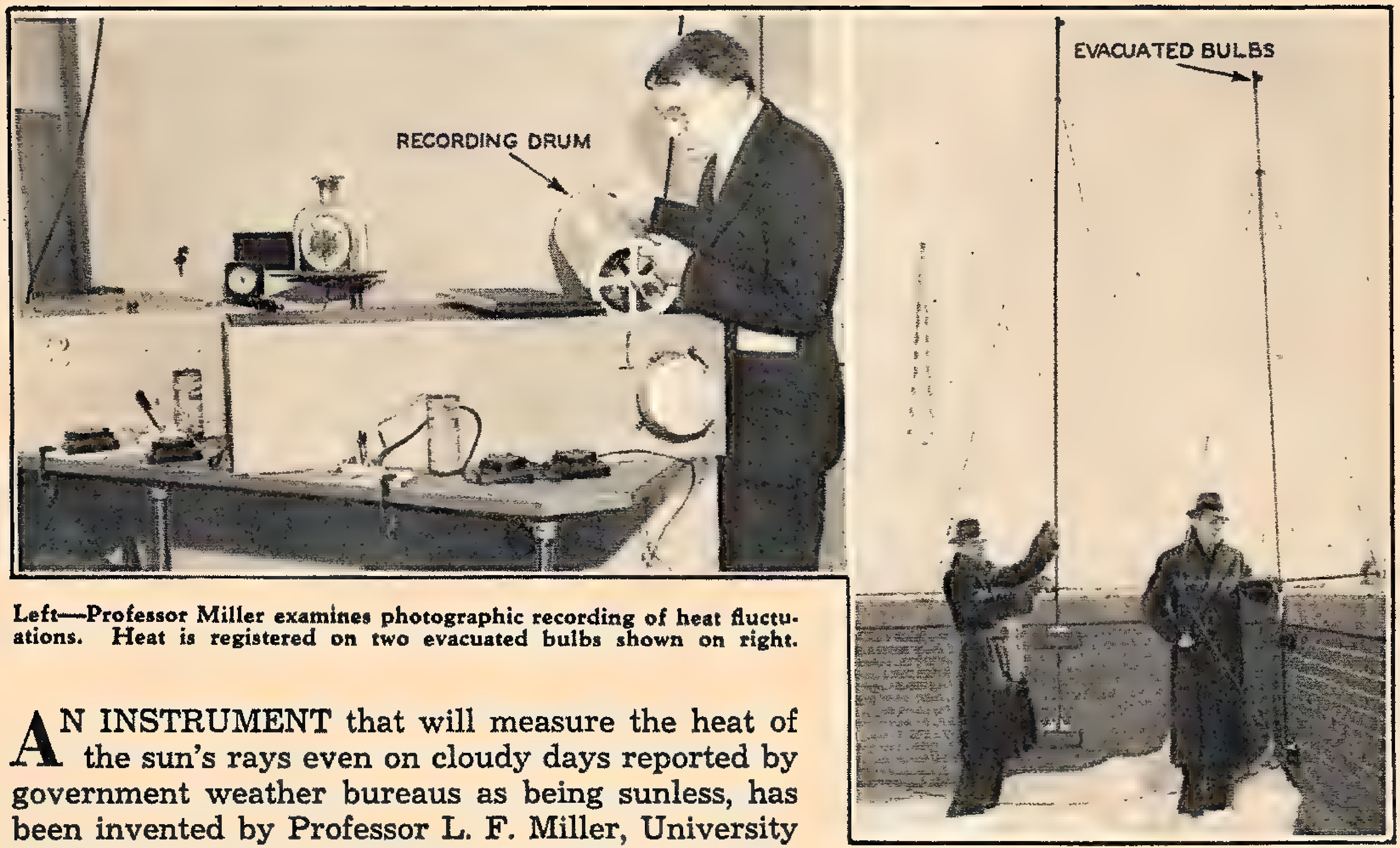
Students with less sensitivity to tone are advised to study instruments with broader tone distinctions such as pianos and other keyboard instruments.

Tiny Gauge Tests Compression

A NEW tiny compression gauge is set onto a steel tube threaded to fit into spark plug holes. It will quickly measure the exact compression of a faulty cylinder as the piston moves to the top.

Tiny pressure gauge is threaded to fit into any spark plug hole.

Instrument Measures Heat of Sun Rays

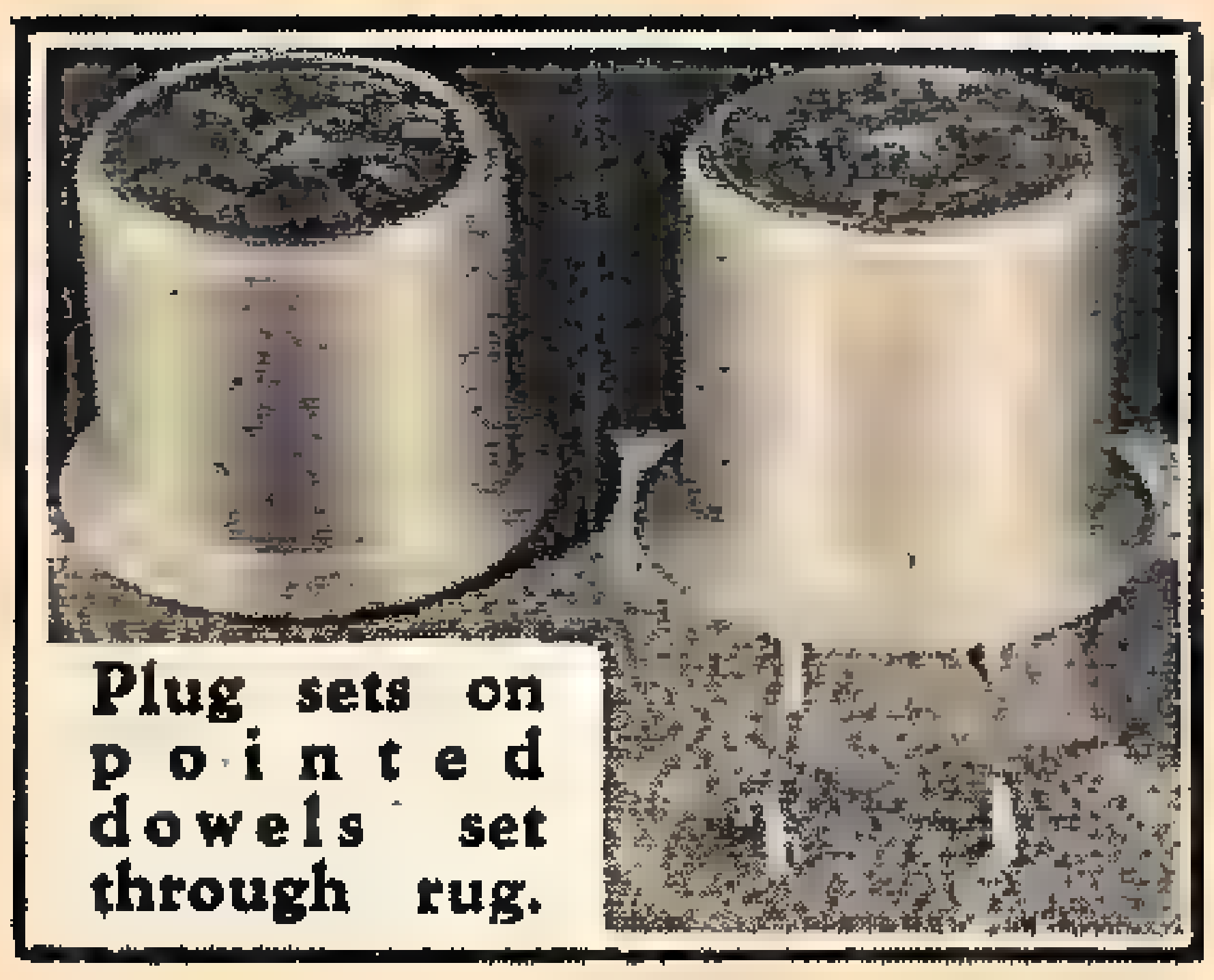


Left—Professor Miller examines photographic recording of heat fluctuations. Heat is registered on two evacuated bulbs shown on right.

AN INSTRUMENT that will measure the heat of the sun's rays even on cloudy days reported by government weather bureaus as being sunless, has been invented by Professor L. F. Miller, University of Minnesota physicist. To gain these accurate measurements, two vacuum bulbs are set up on the roof of the Minnesota physics building. The bulbs are connected by a thermo-couple. Falling on the bare filament of one bulb, the light makes no impression; the other bulb is made of quartz and quickly absorbs heat. The difference in temperature between the two bulbs is recorded on a sensitive galvanometer which governs a light beam to record the fluctuations on a drum.

This extremely accurate measure of the percentage of sunlight is expected to greatly advance the study of vital rays cast off by the sun. It will also provide perfect recordings for Weather Bureau records.

Outlet Plug Pierces Through Rug



Plug sets on pointed dowels set through rug.

TO MAKE electrical connections through a rug without damaging the fabric, a new type plug has been devised. The plug is set onto screws which pass through the rug without tearing. To help locate the terminal block, two pointed dowels extend upward through the rug. The plug is set on these points.

Tubes Replace Strings In Piano

A NEW piano which uses alloy tubes instead of the conventional steel strings will resist any sort of pounding without losing tune, according to the claims made by H. E. Noake, Los Angeles inventor.

As a test of his idea, Noake has had a four octave piano of this type built. It operates from a standard keyboard and produces 49 notes.

The metal tubes are suspended in the place of the strings and are sounded by felt hammers controlled by pressure on the keys.

Miss Vivian Brandt is shown above as she plays the new chime piano. The piano strings have been replaced by alloy tubes.

American RAILROADS

This giant oil-burning locomotive has made Northwestern railroad's new train, *The 400*, the fastest in the country. Note the large, heavily-weighted drive wheels. *The 400* hit a top speed of 91 m.p.h. on its first trip and made 81 miles in 67 minutes on the Chicago-Minneapolis run. Boiler pressure was increased on locomotive and oil fuel used to eliminate coaling stops.

THREATENED by the increasing competition of air lines and busses, the nation's railroads are whittling time schedules, smashing speed records to maintain their position at the top of transportation systems.

First established train to set up a new mark was *The 400,* fastest scheduled train on the American continent. Curiously, *The 400* is not streamlined, lightweight, or Diesel-electric, but a conventional, oil-burning iron horse. Pride of the Chicago & Northwestern railroad, it speeds over the 410 miles of re-ballasted roadbed between Chicago and St. Paul with standard coaches in 420 minutes, one hour, twelve minutes faster than old schedules.

Its average speed of 58.8 miles an hour is faster than *Twentieth Century's* 54.1 m.p.h. or the Burlington's Diesel-electric *Zephyr's* 49.5 m.p.h. The new, oil-burning locomotive of *The 400* features larger drive wheels, 79 inches in diameter compared to 75 inches on similar Northwestern locomotives. As a result *The 400* makes the run between Chicago and the Twin Cities with 5,557 less revolutions of its drive wheels.

This latest streamlined train will run in New England. The Flying Yankee did better than 100 m.p.h. on a test run.

That run between Chicago and St. Paul and Minneapolis is the scene of a speed duel between three railroads, the Northwestern, the Chicago, Burlington & Quincy R. R., and the Chicago, Milwaukee, St. Paul & Pacific R. R. First to meet the challenge of *The 400* was the Burlington with two streamline trains similar to the *Zephyr,* which is now employed on a scheduled run between Kansas City and Omaha. These new, 3-car Diesel-electric units will clip at least 30 minutes off the seven and a half-hour schedule of *The 400,* according to plans.

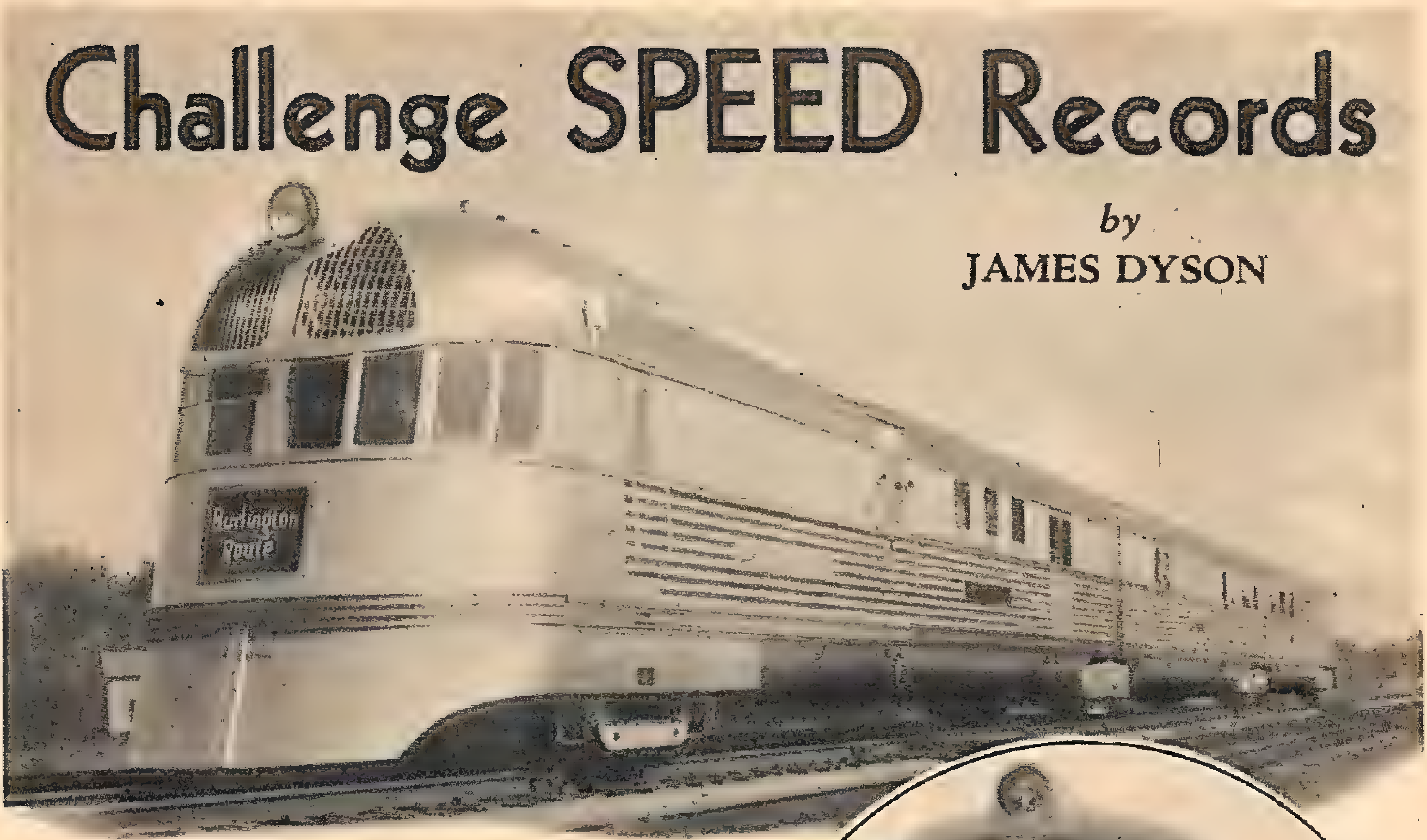
The Milwaukee will also speed up its schedule with two new streamlined oil-burning engines pulling streamlined coaches. They are expected to have a top speed of approximately 100 miles an hour.

Throughout the country similar speed races are in the offing. Union Pacific has inaugurated a 3½ hour schedule over the 187 miles between Kansas City, Mo., and Salina, Kan., with its three-car streamlined *M-10000.* The time reduced old schedules by one-third.

Santa Fe must meet this increased speed on the 67 miles from Topeka to Kansas City, which *M-10000* makes in 72 minutes. Santa

Challenge SPEED Records

by
JAMES DYSON



The Burlington railroad's Zephyr can reach a top speed of 120 m. p. h. Two similar streamlined trains are expected to reduce *The 400's* time on the Minneapolis-Chicago run.

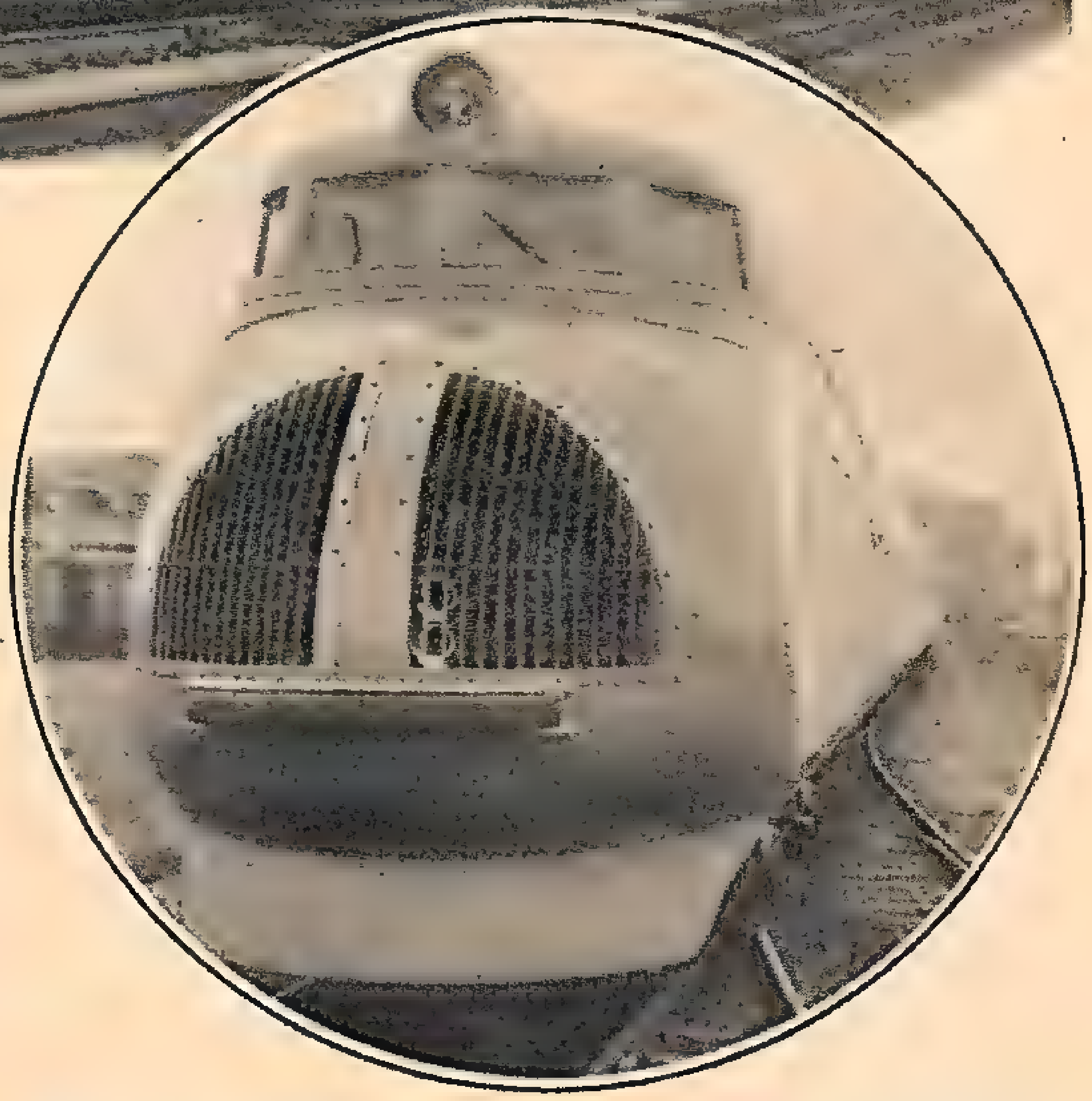
Fe, it is said, plans to reduce this time by two minutes.

This western speed battle probably will extend to the Pacific coast this summer when the Union Pacific puts longer streamline trains in operation. The U. P. hopes to cut the present 54½-hour schedule between Chicago and the coast to about 35½ hours.

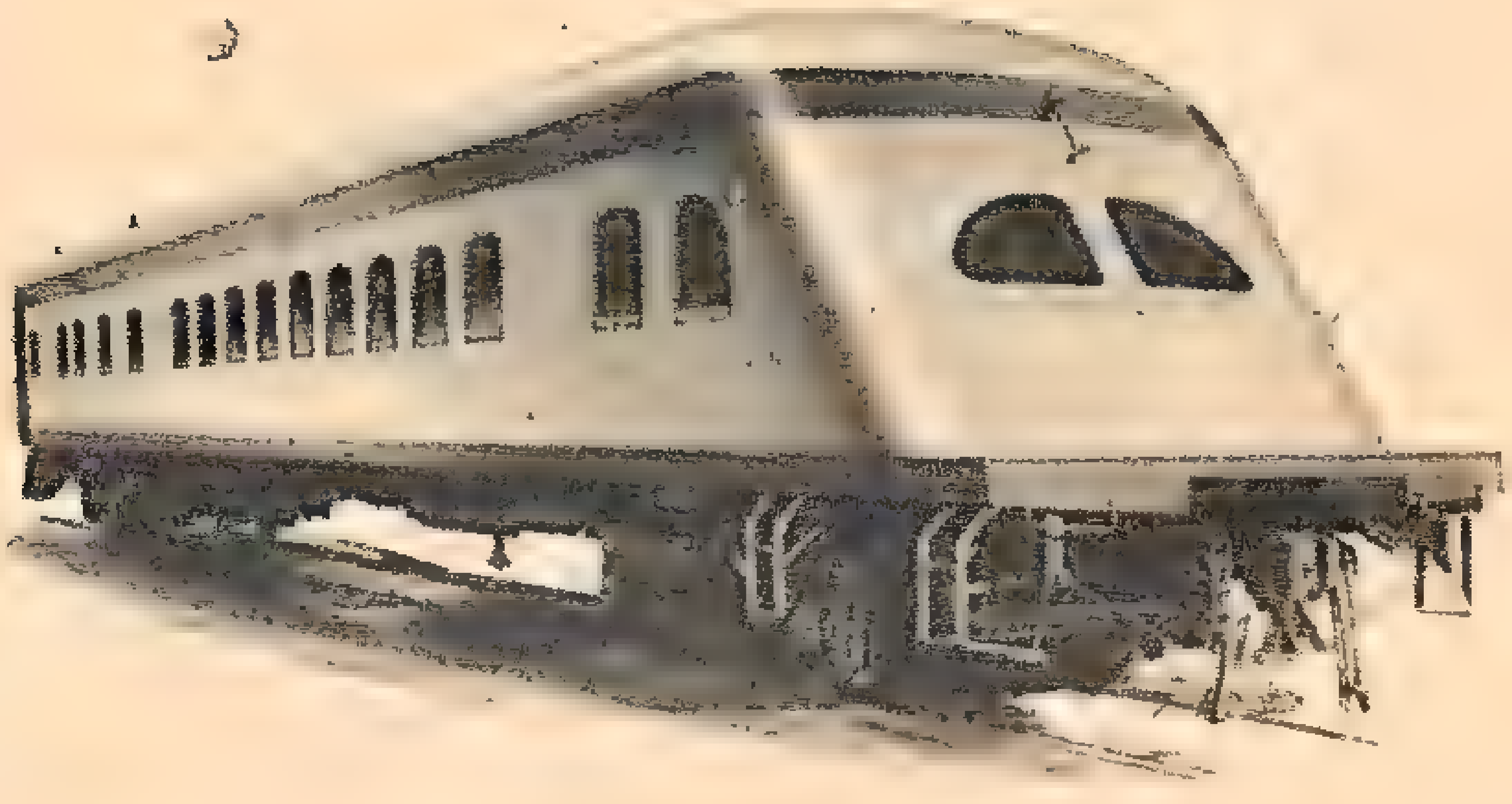
Winton Engine Corp, a division of General Motors, is building a new double unit Diesel locomotive for Santa Fe. The new locomotive can be driven from either end, will be powered with four 900-horsepower engines, and will have a top speed of more than 100 m.p.h. With the new locomotive Santa Fe's crack train, the *Chief*, is expected to make the 2,364 miles between Chicago and Los Angeles in 40 hours, instead of the present 55 hours.

In the East new streamlined electric engines of the Pennsylvania Railroad are cutting schedules between New York and Washington. Competing with the Pennsylvania, the Reading railroad has built a coal-burning, partly streamlined, steam locomotive that clipped off 90 miles in 88 minutes.

A new, streamlined, all-steel passenger train has been built for the Boston & Maine and Maine Central railroad. It attained a speed of more than 100 m.p.h. on a test run between Trenton, N. J., and Philadelphia, Pa.

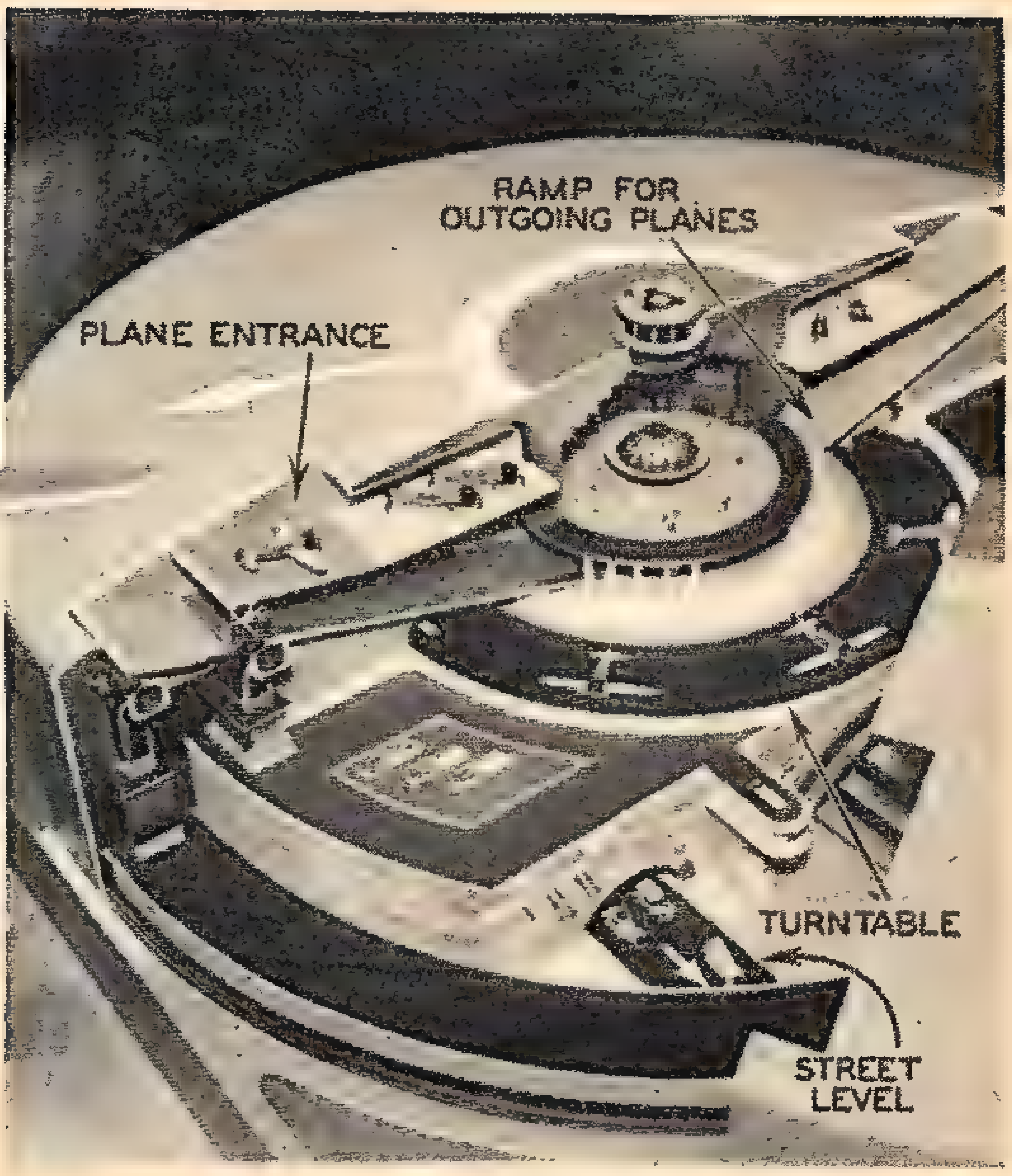


This Union Pacific streamlined train broke the trans-continental record. U. P. now plans to increase its new trains to 11 cars pulled by two Diesel engines of 1,200 and 900 h. p. respectively. The record breaking train above has three cars.



This coach will be used on the Milwaukee's new streamlined trains between Chicago and Minneapolis. New oil-burning streamlined engines will have a top speed of 100 m. p. h. "Badger tail" car above will be used on rear of new train.

600-Passenger Plane of Future to Use Underground Airport



Left—Dr. W. W. Christmas is holding a model of his 600-passenger plane. Right—Cross-section of proposed airport.

LOOKING into the future and visualizing the fact that aviation will handle a great bulk of the world's transporation, Dr. William Christmas, noted inventor-aviator, has designed a new 600-passenger air-liner and a giant underground airport to service the planes and handle the passengers.

The 600-passenger liners will be built with a two-story fuselage and will have an over-all wing spread of 400 feet. Motors of 25,000 horsepower will drive 75-foot propellers at a rate which will carry the planes at a speed of 200 miles per hour. Amphibious and carrying all the luxuries of a modern steamship, the plane is expected to be too large to be affected by adverse weather conditions.

The airport will house a United States post office, hangars, and service rooms for the planes. Landing on the wide, curved roof, the planes will trundle down a ramp onto a turntable where they will be swung directly in front of the post office to discharge passengers. Elevators then carry the passengers to underground automobile and railroad lanes where they may continue their journey.

Defense Gun Hurls Balls of Fire

A GUN which shoots eight streaking balls of fire in rapid succession is now being tested as a possible anti-aircraft gun to set fire to enemy planes during wartime.

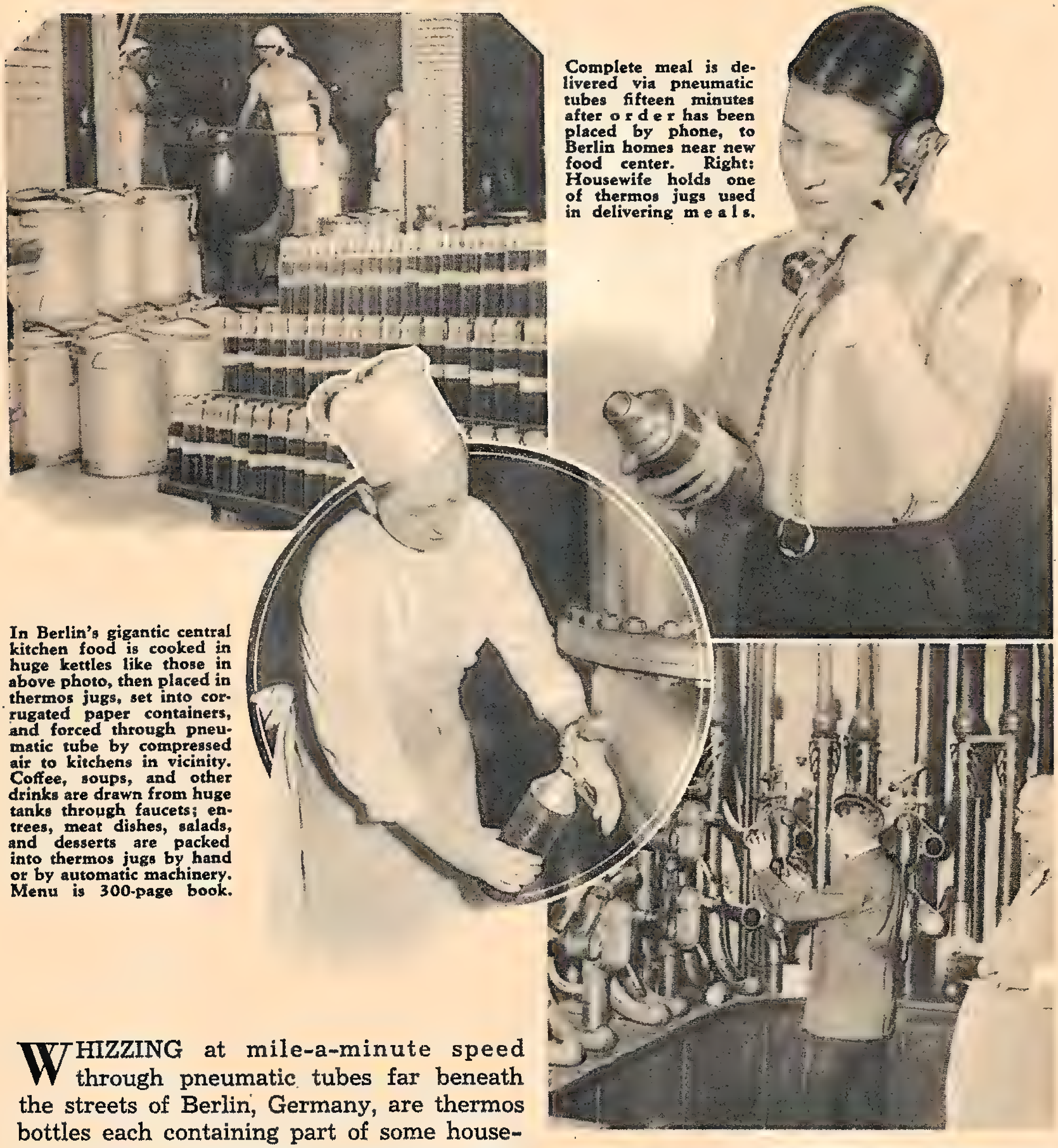
The gun is built on a "Roman Candle" principle, each ball being separately ignited from a battery as the trigger is pulled. A metal funnel on the end protects the operator from flying embers cast by the imperfect powder balls now being used.

Photo shows a police officer demonstrating the fire-ball gun. An electric battery ignites the powder when the trigger is pulled to send the fiery balls flaring through the sky. The funnel guards user from dangerous flying sparks.

Bombard Nitrogen to Get Oxygen

THE dreams of the old alchemists to build heavy elements out of lighter ones has been realized by Dr. W. D. Harkins, University of Chicago scientist, who recently made oxygen by bombarding nitrogen, a lighter gas, with the neutrons of atoms.

Pneumatic Tubes Shoot Hot Meals To Homes



Complete meal is delivered via pneumatic tubes fifteen minutes after order has been placed by phone, to Berlin homes near new food center. Right: Housewife holds one of thermos jugs used in delivering meals.

In Berlin's gigantic central kitchen food is cooked in huge kettles like those in above photo, then placed in thermos jugs, set into corrugated paper containers, and forced through pneumatic tube by compressed air to kitchens in vicinity. Coffee, soups, and other drinks are drawn from huge tanks through faucets; entrees, meat dishes, salads, and desserts are packed into thermos jugs by hand or by automatic machinery. Menu is 300-page book.

Loaded thermos jugs are slipped into these pneumatic tubes at food kitchen, for delivery to homes. Separate pipe runs from kitchen to each home getting service. Compressed air pushes containers at high speed through the smooth tubes.

WHIZZING at mile-a-minute speed through pneumatic tubes far beneath the streets of Berlin, Germany, are thermos bottles each containing part of some housewife's meal. A phone call is enough to bring, in less than fifteen minutes, a complete meal ready to serve, containing exactly the desired quantity and kind of food for each course.

Housewives select their meals from a 300-page menu book distributed to tenants in every apartment house and home within a radius of ten blocks of the gigantic central kitchen. Orders may be placed by phone for delivery at any specified time.

In the kitchen food is prepared in huge galvanized troughs and pots. Long rows of thermos bottles are stacked in readiness to receive dishes ready for delivery. The bottles are wrapped in corrugated containers in preparation for their trip through the vast network of underground tubes.

Newer homes in Berlin will have no kitchens—simply a few pneumatic tube outlets beside the kitchen cabinet or sink. With the elimination of all stoves and ovens in the home, the fame of German women for tasty cooking may soon pass into obscurity.

Extra Paper!

Reader buys the "extra" from newsboy without realizing how fast news is gathered.

Racing Time for

by

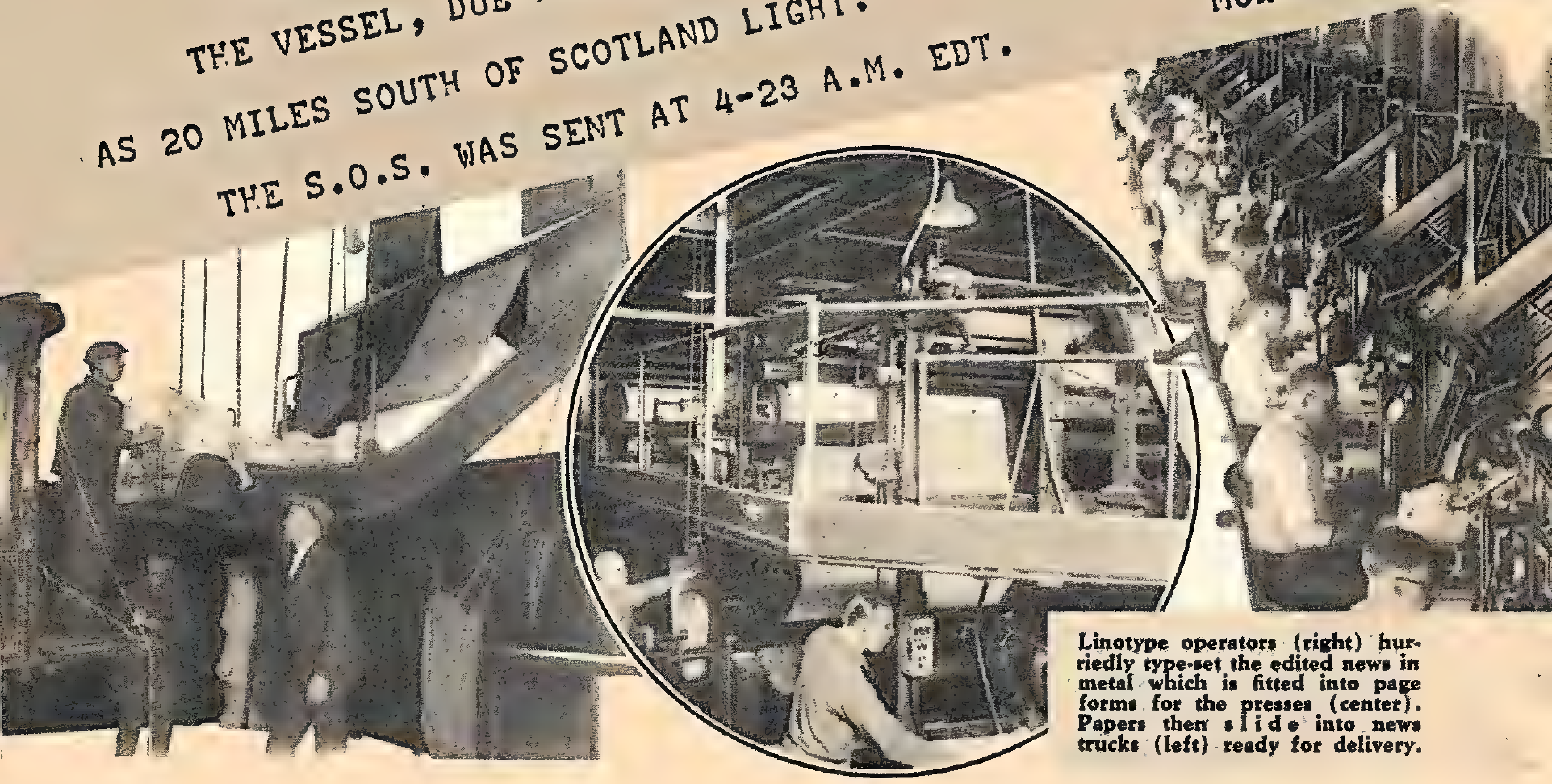
ROBERT L. FREY
Executive Assistant
United Press Associations

NEWS travels fast. It circles the globe like lightning while historic events are still in the making.

The world was reading the tragic details of the *Morro Castle* disaster while her passengers were still leaping from the burning decks of the doomed Ward Liner into the storm-swept waters of the Atlantic.

Less than 20 minutes after first radio operator Rogers sent his SOS from the *Morro Castle,* the tragic story was flashed over

BULLETIN
ADD MORRO CASTLE--NEW YORK X X X MARINE.
THE VESSEL, DUE HERE AT 10 A.M., TODAY, GAVE ITS POSITION
AS 20 MILES SOUTH OF SCOTLAND LIGHT.
THE S.O.S. WAS SENT AT 4-23 A.M. EDT. MORE RM448A



Linotype operators (right) hurriedly type-set the edited news in metal which is fitted into page forms for the presses (center). Papers then slide into news trucks (left) ready for delivery.

News Scoops

Flash!

FLASH

NEW YORK--RCA PICKS UP SOS FROM PASSENGER LINER MORRO CASTLE

UPA NX RM442A

BULLETIN

NEW YORK, SEPT. 8.-- UP --THE PASSENGER LINER MORRO CASTLE,
AFIRE OFF THE NEW JERSEY COAST, FLASHED AN S.O.S., RECEIVED
HERE BY RADIO MARINE.

MORE RM445A

At 4:23 a. m. Morro Castle radio operator sent SOS. While passengers were leaping into sea (arrows in top photo), U. P. at 4:42 a. m. sent flash, then bulletin, then "add" (on opposite page) exactly as reproduced here for extra papers.

A section of the New York bureau of the United Press, nerve center of the association. Men at left are operators sending news over wires. Arrow shows sending tape. Man at long table in center is filing editor who decides which stories shall move first. In background center are copy editors. At right at typewriter is rewrite man.

United Press leased wires into newspaper offices from coast to coast. Cables carried it to Europe, South America and the Orient.

Rogers' signal was sent at 4:23 a. m. Picked up by the marine radio division of the Radio Corporation of America, it was relayed by telephone to the United Press. Amid the rattling battery of automatic telegraph printers in the New York office, the night editor took the message. He jumped from the telephone, shouted "Flash." Instantly a deathly silence swept the room.

Loudly but clearly he shouted the sentence to the waiting telegraph printer operators that would mean extra editions and streamer headlines to newspapers throughout the world:

FLASH

NEW YORK — RCA PICKS UP SOS FROM PASSENGER LINER MORRO CASTLE

UPA NX RM442A

The message completed, each operator rang

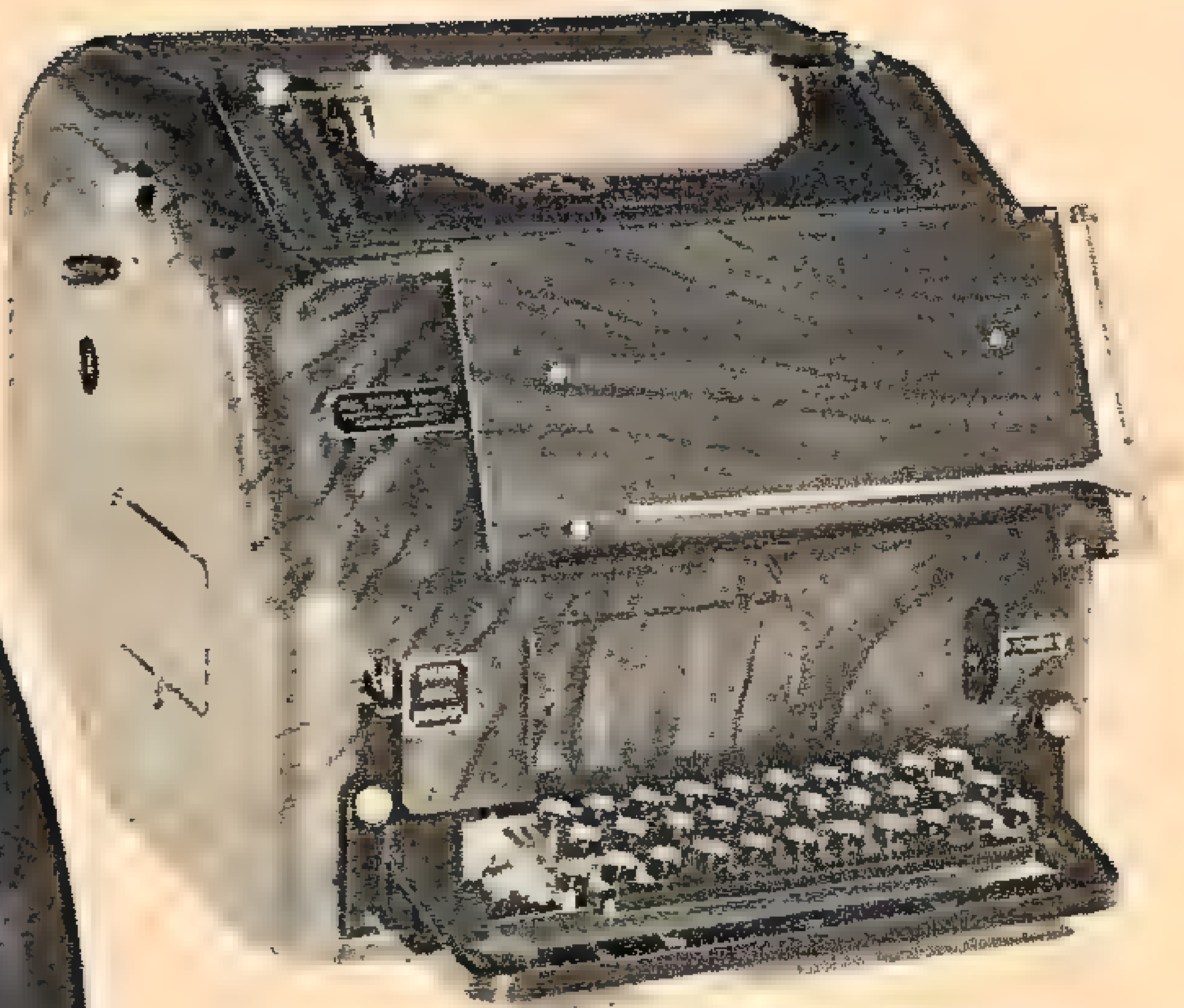
Bureaus FLASH Photos

the bell on his machine ten times. On every receiving machine in newspapers throughout the land a similar bell rang ten times. Again silence while the night editor hurriedly wrote the three line bulletin subflash of the first story of the disaster.

While he was still writing his assistant had grabbed hat and coat and quickly left for Asbury Park, N. J., where the flaming vessel had been sighted eight miles off shore. Between snatches of the story relayed by telephone from R. C. A., the editor put through hurried phone calls, aroused United Press editors, reporters, and correspondents and ordered them to stations along the New Jersey coast to pick up every smattering of the story possible.

Reporters phoned New York from a dozen points—calling in disconnected details of the tragedy, stories from the survivors, condition of rescued passengers and crew, rescues by the Coast Guard and Jersey fishermen. Reporters went to sea, flew in planes, interviewed every one who had the slightest in-

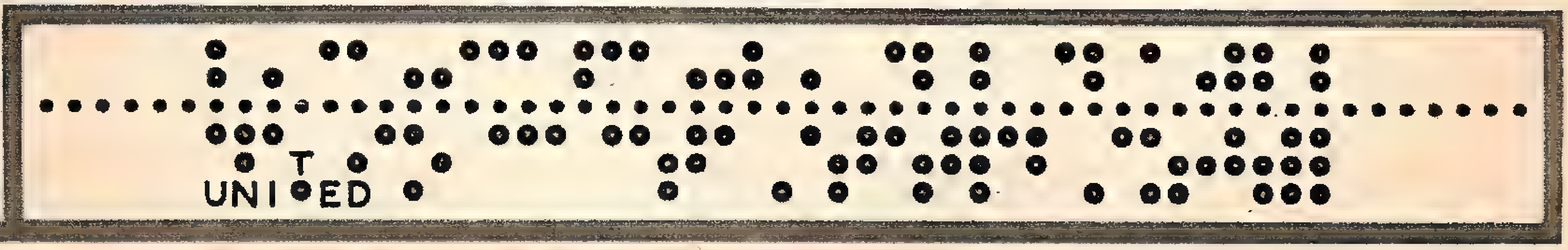
Reporters writing running story of Bruno Hauptmann (arrow above) murder trial give "takes" to messenger boys who rush to telegraph operators (below) in another room. They send it in Morse code to New York for the press association wires.



Above automatic telegraph typewriter both sends and receives. As sending machine it punches out tape which passes through transmitter to send electric impulses over wires.

UNITED PRESS ASSOCIATIONS, NEW YORK.

Each vertical line of dots in sending tape below is a character, space or punctuation mark. Sent through machine, receiving newspaper would see typed words shown above.



Across U. S. by Wire

formation about the tragedy, patiently listed every rescue and death to bring to the world the tragic story of fire at sea. The hastily assembled editors in the New York office of the United Press in turn gathered the disconnected material by telephone and telegraph and rewrote it into the coherent stories you read in your daily newspapers.

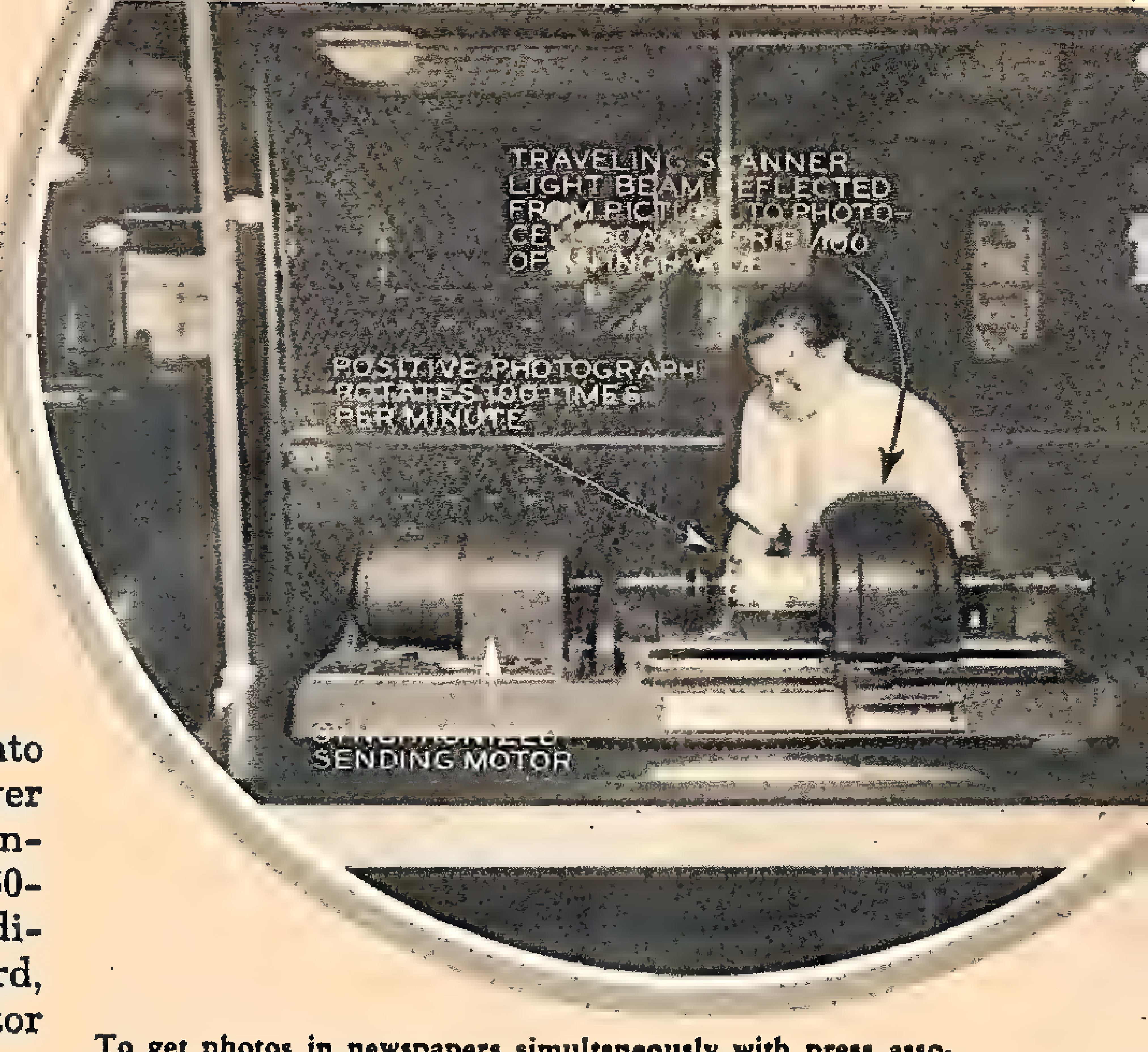
That first flash of the disaster broke into the routine news that was being sent over the United Press wires. The operator instantly broke the smooth flow of the 60-words-a-minute sending tape, used for ordinary news, switched to the direct keyboard, and punched out the flash as fast as the editor dictated it.

From that time on the story of the Morro Castle disaster, fed to the operators in short "takes," took precedence over all other news.

When Cornwallis surrendered at Yorktown, ending the Revolutionary War, it took 49 days for that news to reach England. Today such news would "flash" over United Press wires reaching 1,252 newspapers in nearly every nation of the world within 10 minutes.

Scanning headlines over their morning coffee, few newspaper readers are aware of the vast newsgathering network of telegraph wires and cables, the thousands of correspondents, laboring 'round the world and 'round the clock to bring today's news to them today.

Bruno Hauptmann testifies in the Lindbergh kidnap-murder trial, a few minutes later millions of newspaper readers know his answer to every question. A noted European statesman dies; within ten minutes the news has reached this country and a few minutes later extras are on the street telling of his death. The first flier to cross the Atlantic alone lands in Paris; within five minutes the news is in American newspaper offices and newsboys are crying "Extra!" 20 minutes later.

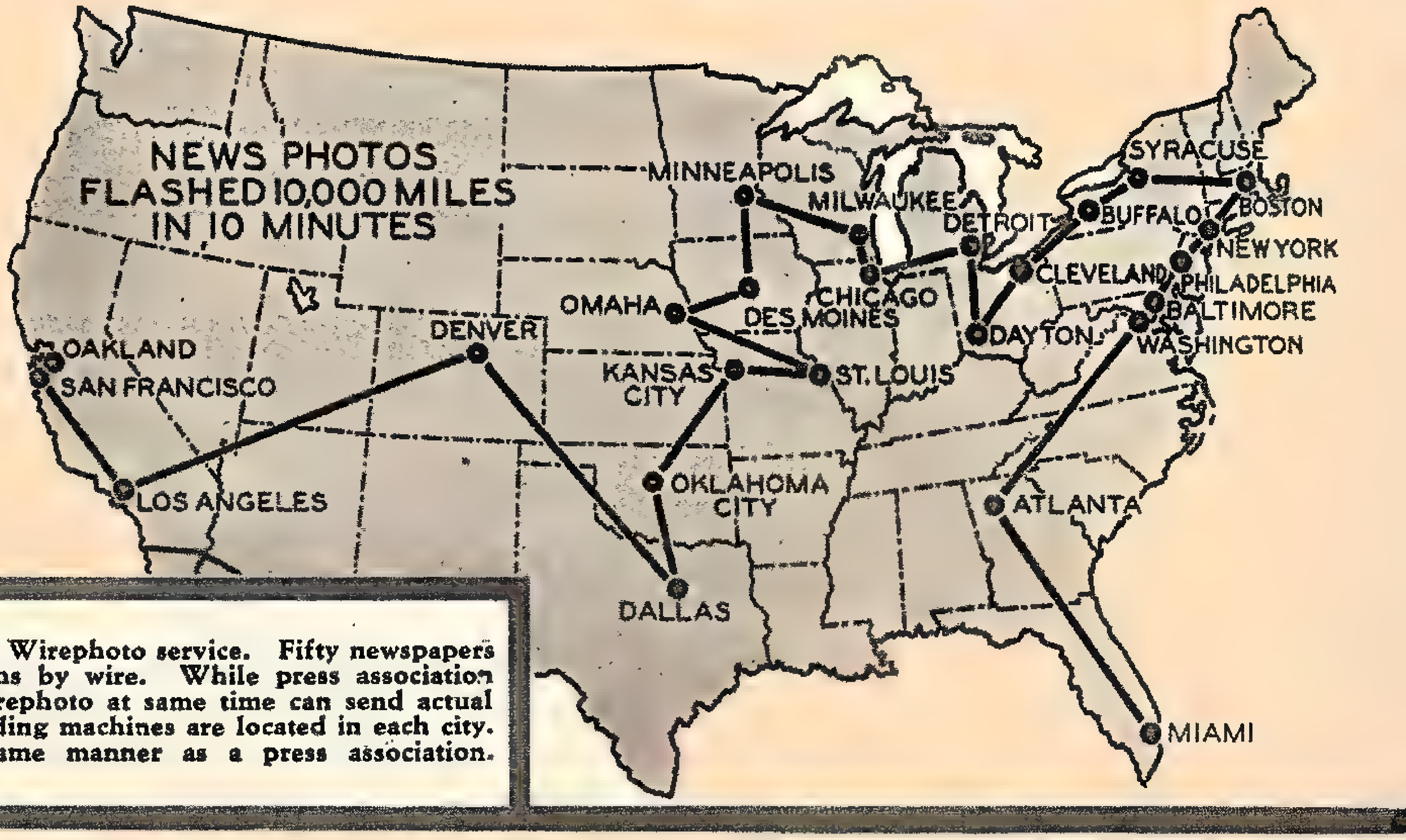

TRAVELING SCANNER
LIGHT BEAM REFLECTED
FROM PICTURE TO PHOTO-
CELL SCANS STRIP 1/100
OF AN INCH WIDE
POSITIVE PHOTOGRAPH
ROTATES 100 TIMES
PER MINUTE
SYNCHRONIZED
SENDING MOTOR

To get photos in newspapers simultaneously with press association stories, Associated Press has developed Wirephoto service to send pictures by wire. Photocell scans photo, sends impulses over wire to similar receiving machine which has light-valve that acts on sensitive negative. After being developed, print is made and half-tone cut prepared for newspaper.

A press association is a world-wide news gathering agency. It supplies your local paper with all the important news that "breaks" outside of your city. The press association serves hundreds of newspapers in many countries of the world, each paper paying a fixed fee for the service.

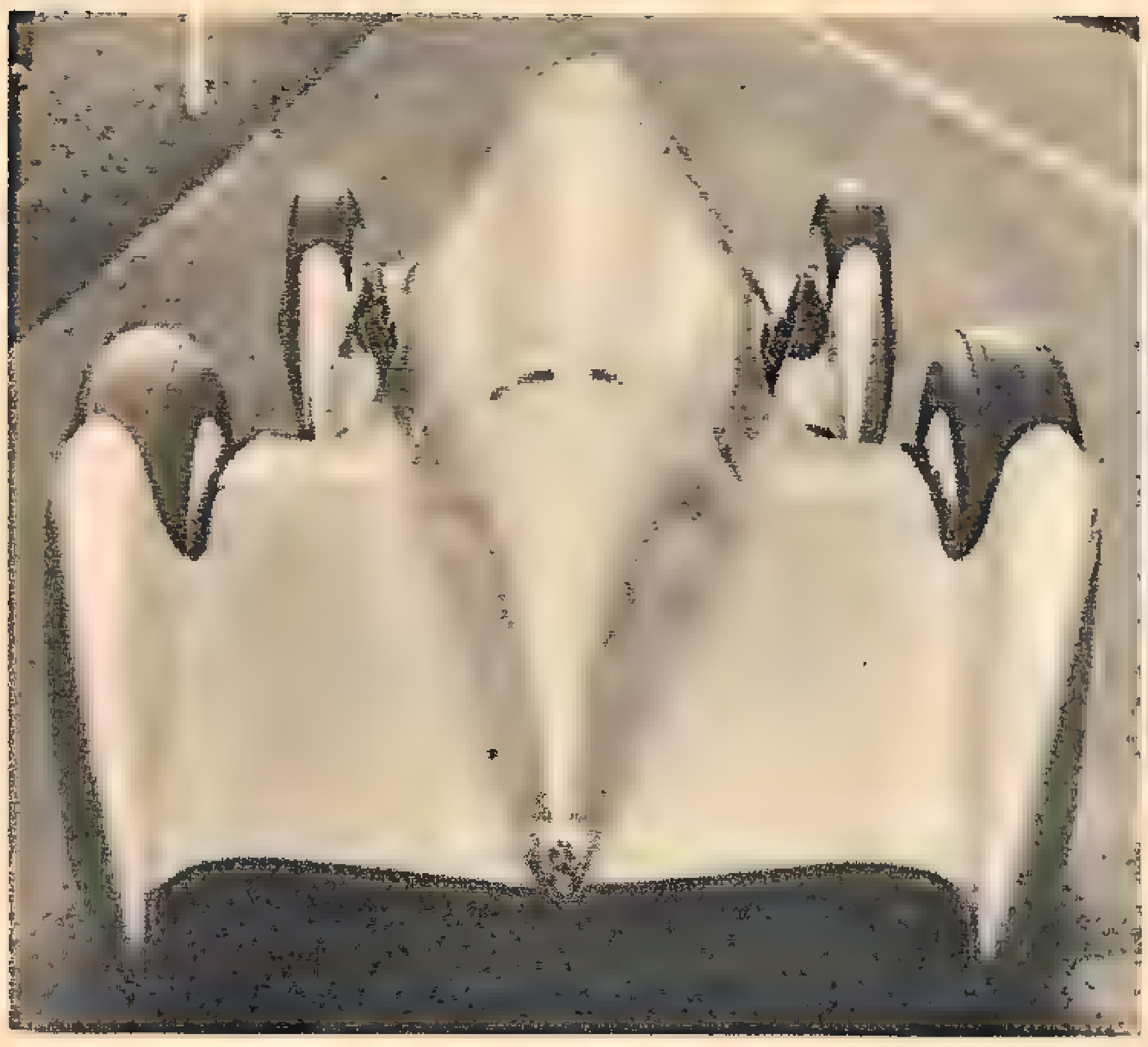
The press association maintains key bureaus in important cities and capitals of the world which in turn control smaller bureaus

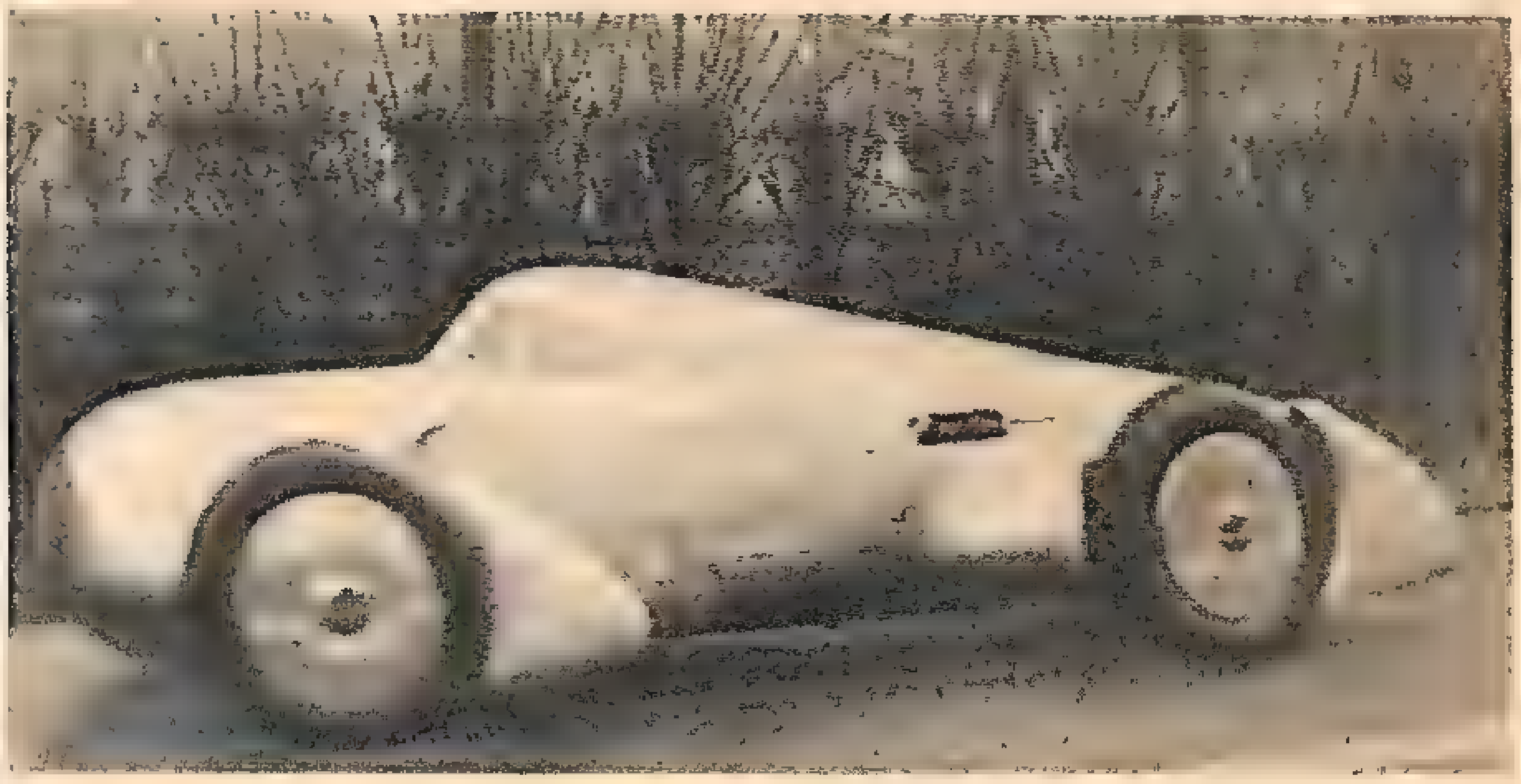
[*Continued on page* 144]


NEWS PHOTOS
FLASHED 10,000 MILES
IN 10 MINUTES
MINNEAPOLIS
MILWAUKEE
DETROIT
SYRACUSE
BUFFALO
BOSTON
NEW YORK
CLEVELAND
PHILADELPHIA
BALTIMORE
WASHINGTON
CHICAGO
DES MOINES
OMAHA
DAYTON
KANSAS CITY
ST. LOUIS
DENVER
OAKLAND
SAN FRANCISCO
LOS ANGELES
OKLAHOMA CITY
ATLANTA
DALLAS
MIAMI

The wire route of AP's new Wirephoto service. Fifty newspapers in 24 cities get photographs by wire. While press association sends story of disaster, Wirephoto at same time can send actual photos. Receiving and sending machines are located in each city. Service is controlled in same manner as a press association.

German Racer Has Vanes to Deflect Rushing Air Currents





Left—Photo shows the fin-like vanes on the rear of the new racer. Right—The racer in a test run. Note inclosed cab.

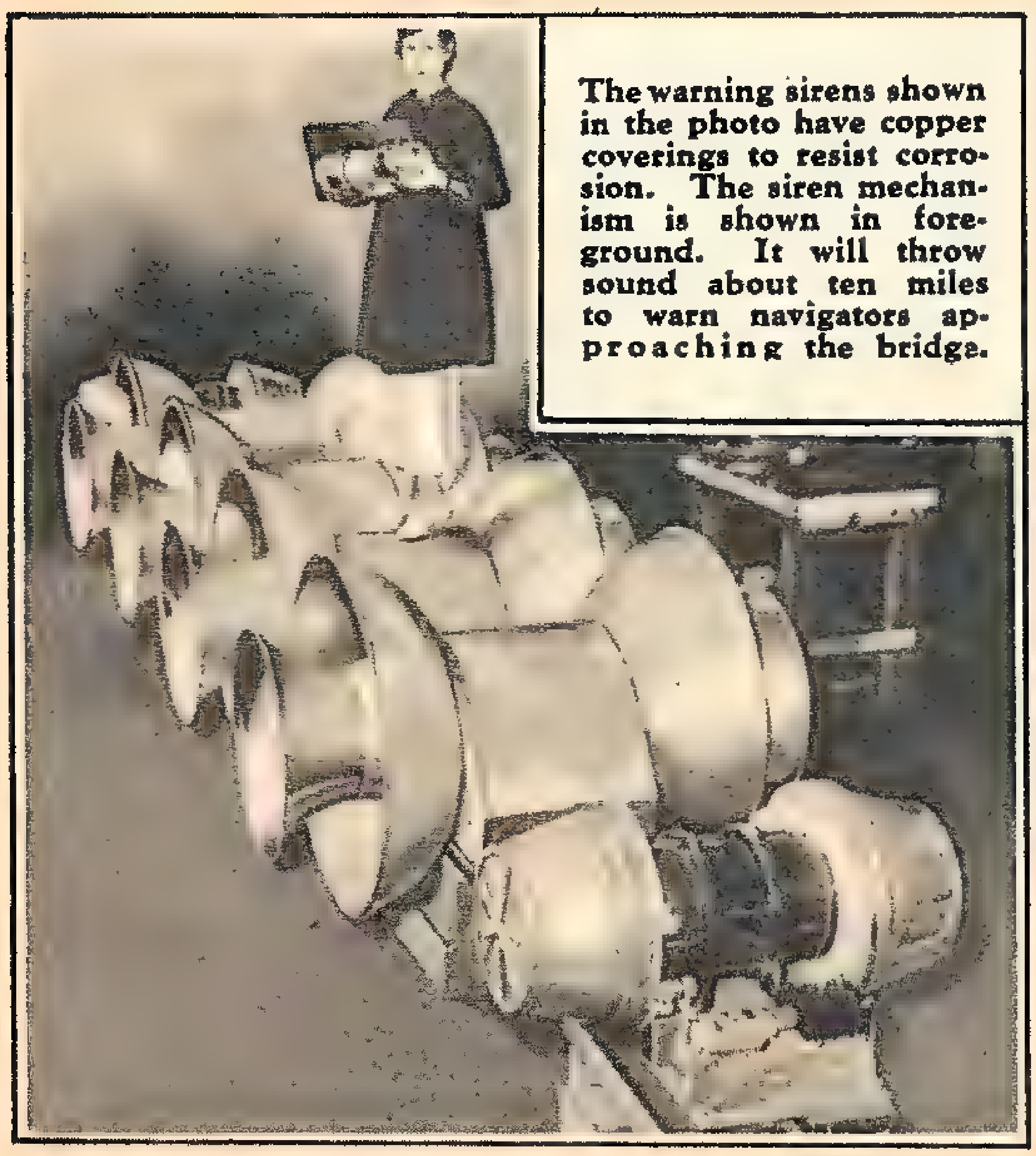
A SUPER-RACER, with long areodynamic lines sweeping smoothly from a blunt nose to an arrow-shaped rear end, has been designed and built by German engineers. The car will attempt to break the existing world's land speed record now held by Sir Malcolm Campbell, British racing driver.

Contrary to the customary design, the drivers seat is entirely enclosed and incorporated into the body of the auto as a sloping turret. Wind foils behind the wheels and vanes in the rear deflect the rushing air currents smoothly to prevent vacuum as the auto speeds forward.

Big Siren Throws Sound 10 Miles

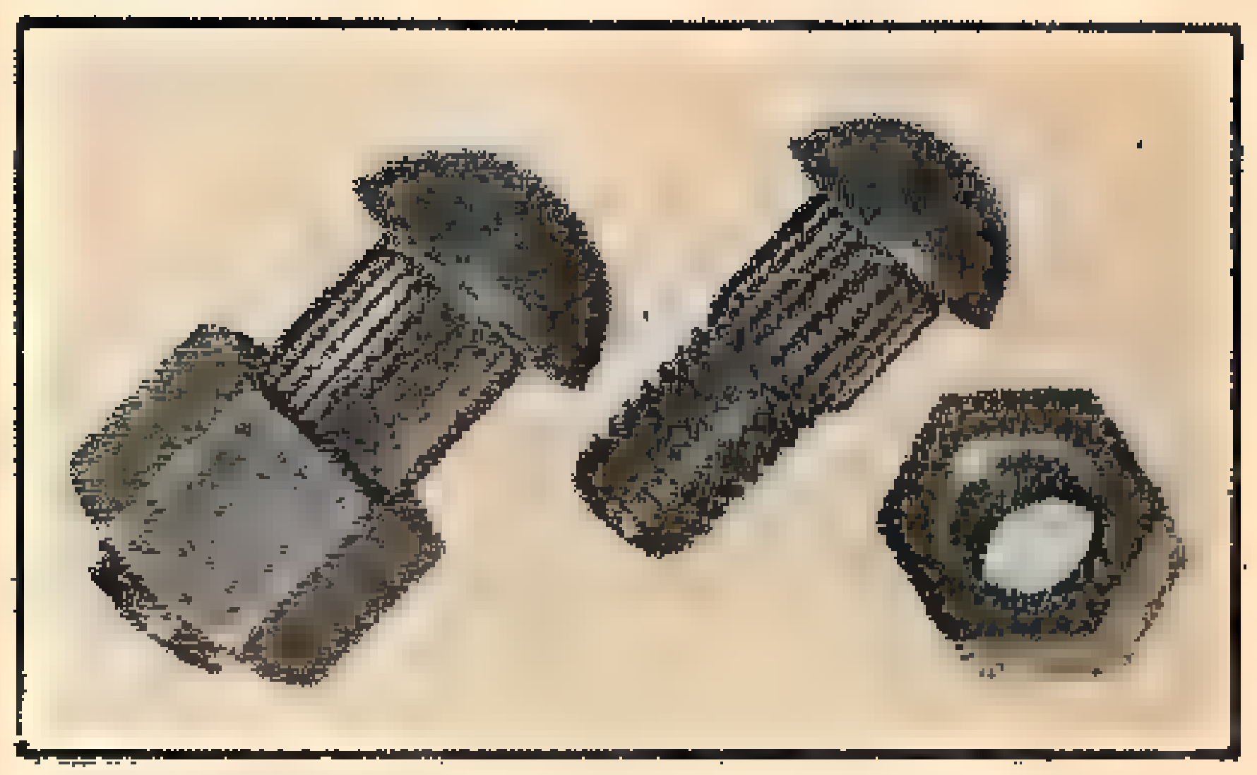
LARGE sirens that will send their staccato, coded warnings ten miles through the fog to warn approaching vessels, have been installed as guarding signals on each pier of the world's largest bridge across the San Francisco-Oakland Bay.

The sirens are double-headed, and will throw sound at right angles to the bridge in both directions. Since the direction of the sound is set in this manner, navigators can tell their relative position to the piers by the intensity of the pitch. When in direct alignment with the pier, the pitch is highest. The bells, marking secondary channels, and sirens, are controlled from sub-stations on each side of the bridge.



The warning sirens shown in the photo have copper coverings to resist corrosion. The siren mechanism is shown in foreground. It will throw sound about ten miles to warn navigators approaching the bridge.

Ribbed Bolts Replace Hot Rivets



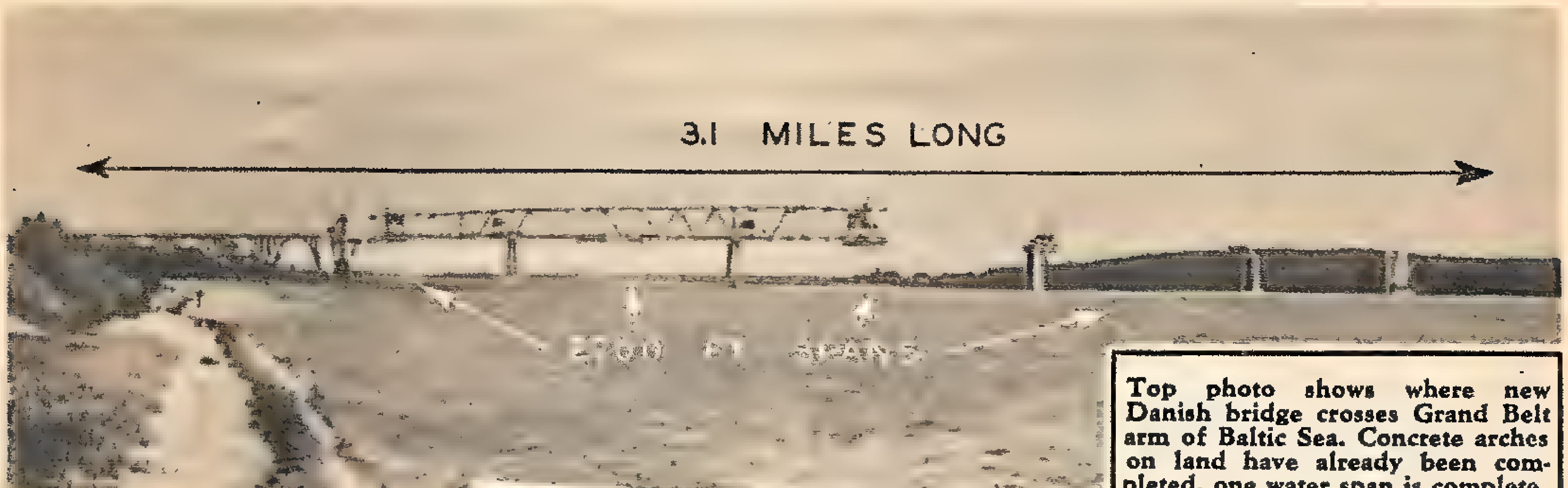
The ribbed bolts can be driven into a bolt hole with a heavy hammer.

HOT rivets may be replaced by a new ribbed rivet bolt for steel construction work. When driven through the bolt hole and tightened, the new bolt is said to form such a tight body-fit that it cannot be displaced. The neck of the bolt is ribbed and about one thirty-second of an inch larger than the hole into which it must be driven.

New Tubes Change D. C. to A. C.

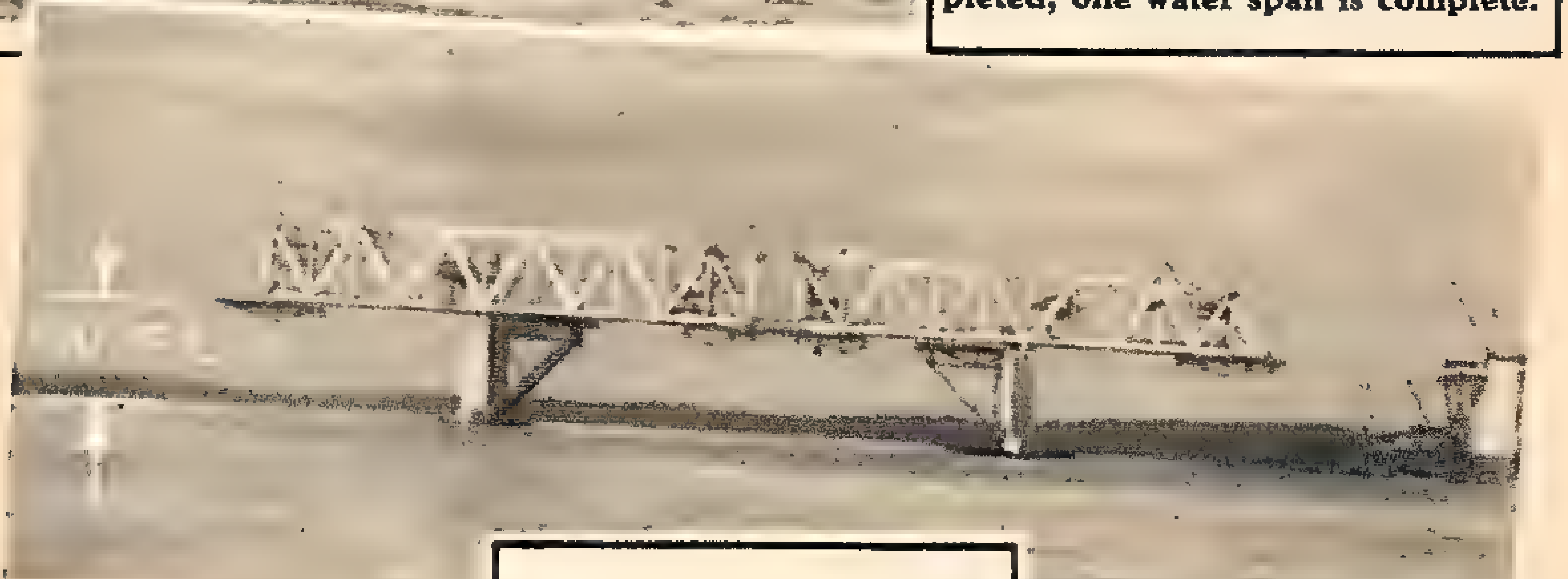
ELECTRICITY in the form of direct current can now be transmitted at high voltages and converted into alternating current at any place along the line where power of a lower voltage may be needed. This new method of transmission involves the use of giant thyraton and phanotron tubes. Such tubes and other necessary machinery will be placed in sub-stations along power lines.

Three-Mile Bridge Spans BALTIC SEA



Top photo shows where new Danish bridge crosses Grand Belt arm of Baltic Sea. Concrete arches on land have already been completed, one water span is complete.

FEATURES OF THE BALTIC SEA CANTILEVER BRIDGE
Total length is over 3 miles. Connects Denmark to Funen Isle. Has five 2700-ft. water spans. Roadway is 100 ft. above water. Has one giant automobile highway and two railroad tracks. Five concrete arches are on land. Piers are over 250 feet high. Cantilever bridge method used. Spans part of the Baltic Sea 100 feet deep in places.



How teeter-totter or balancing method is used to erect cantilever bridges.

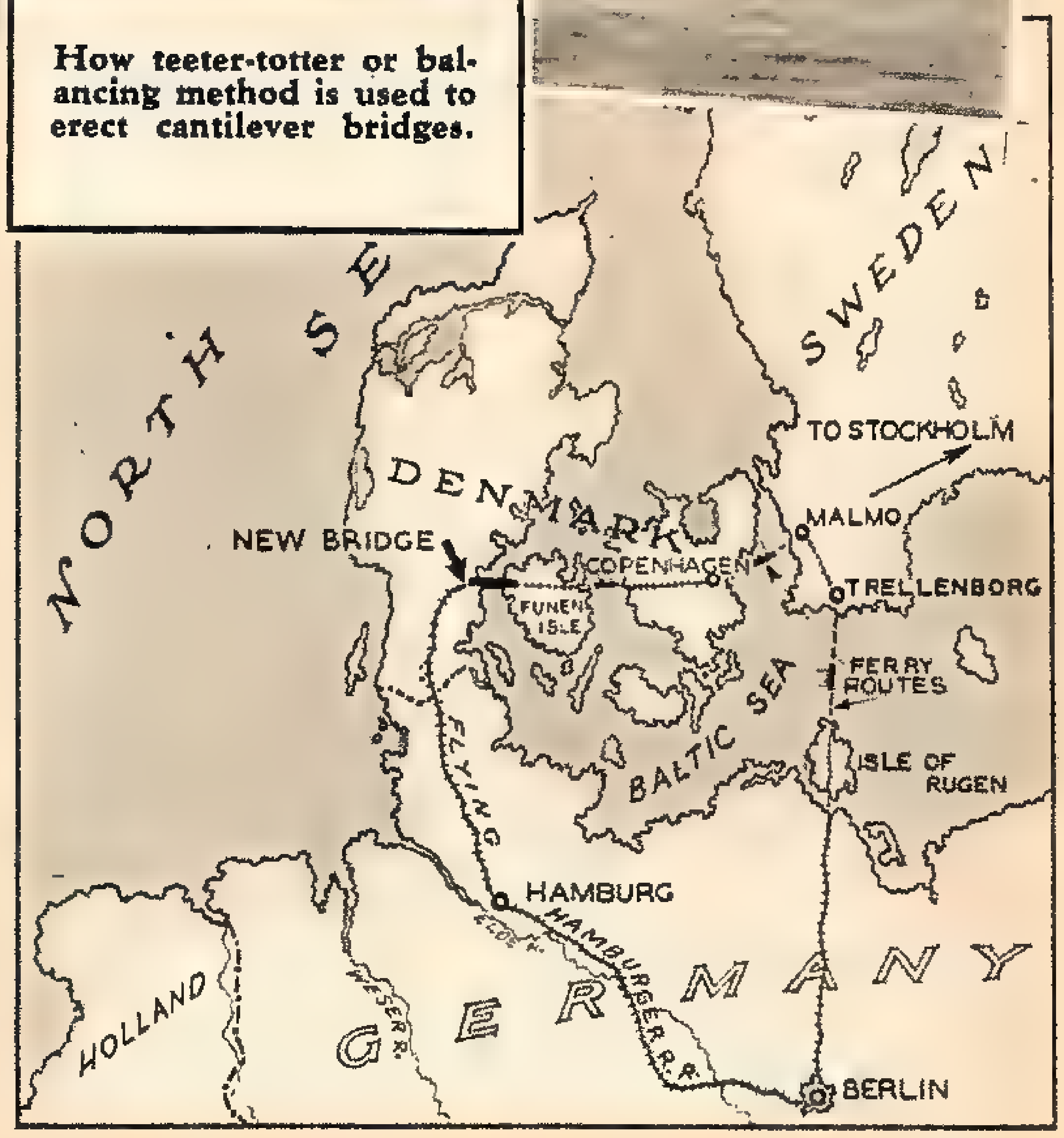
by HANS F. KUTSCHBACH

THREE miles of steel roadway. resting on five massive concrete piers, will soon carry the Flying Hamberger, Germany's crack passenger train, from the continent to the Danish Isle of Funen, shortening the travel time between Berlin and Copenhagen. Equal in importance to the mile-long Golden Gate span is this gigantic European project, begun early in 1930. When completed this year, trains and automobiles will be able for the first time in history to reach Funen directly rather than by ferry.

Five arches, each more than half a mile long, support the roadway 100 feet above the level of the sea. This arm of the Baltic being an international channel of navigation, the bridge must have clearance above the waters for the largest ocean liners and warships.

Steel and concrete piers reaching down into the water an even greater distance than they extend into the air rest upon solid beds of clay 25 feet below the bottom of the sea.

With rough seas threatening to wreck work barges, it was necessary to build the overwater spans piece by piece, high in the air, and use the cantilever method of bridge construction. Work was started in both directions from each pier, building out the same amount on each side to keep the tons of steel in perfect balance. Engineering calculations were of necessity carried out to the fraction of an inch, to insure meeting of the teetering girders at the mid point.



Map shows location of new bridge, as well as route of Flying Hamberger, German passenger train, which will use bridge.

With the completion of the new bridge, trains can run directly to Funen from Berlin, and thence by ferry and land routes to Stockholm, Sweden. Other trains will make a "great-circle" trip, turning back to Berlin after reaching Malmo, Sweden.

How I Judge CHAMPIONSHIP FIGHTS

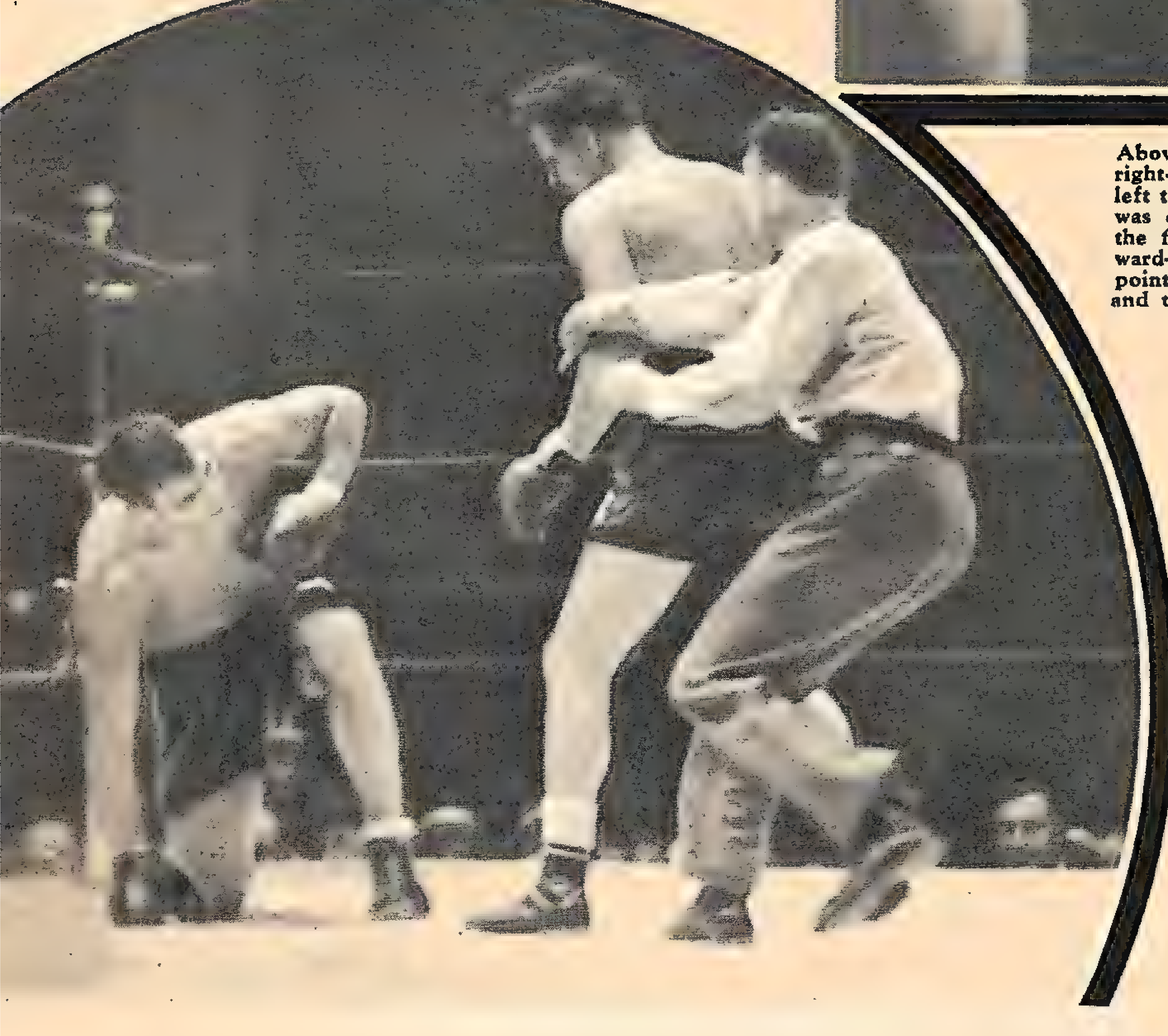
ONE minute to go! Fighting men ripping and tearing at each other. . . . A figure in white moves nimbly around them. . . . The glare of floodlights. . . . A sea of faces in the darkness beyond. . . . Then—

The bell. . . . As one, the great crowd is on its feet. . . . There is a tense pause. . . . In the center of the ring, an arm is lifted in victory. . . . A chorus of hoots greets the decision. . . . The resentment grows. . . . There is pandemonium.

How many times a year do we witness this scene in the oldest and certainly the most glamorous of all sports? Too often, maybe, for the good of the game. In many places where boxing is legal, decisions that bring hoots of derision from the fans are doing incalculable injury to a fine sport.

What is wrong? Is it the system of selecting the winner? Is it the practice of naming

Above—Baer steps inside of a right-hook to land a hard straight left to Carnera's chest. The blow was cleanly made, delivered with the fist closed, the knuckles forward—the type of punch that is a point winner both with the judges and to the most critical audience.

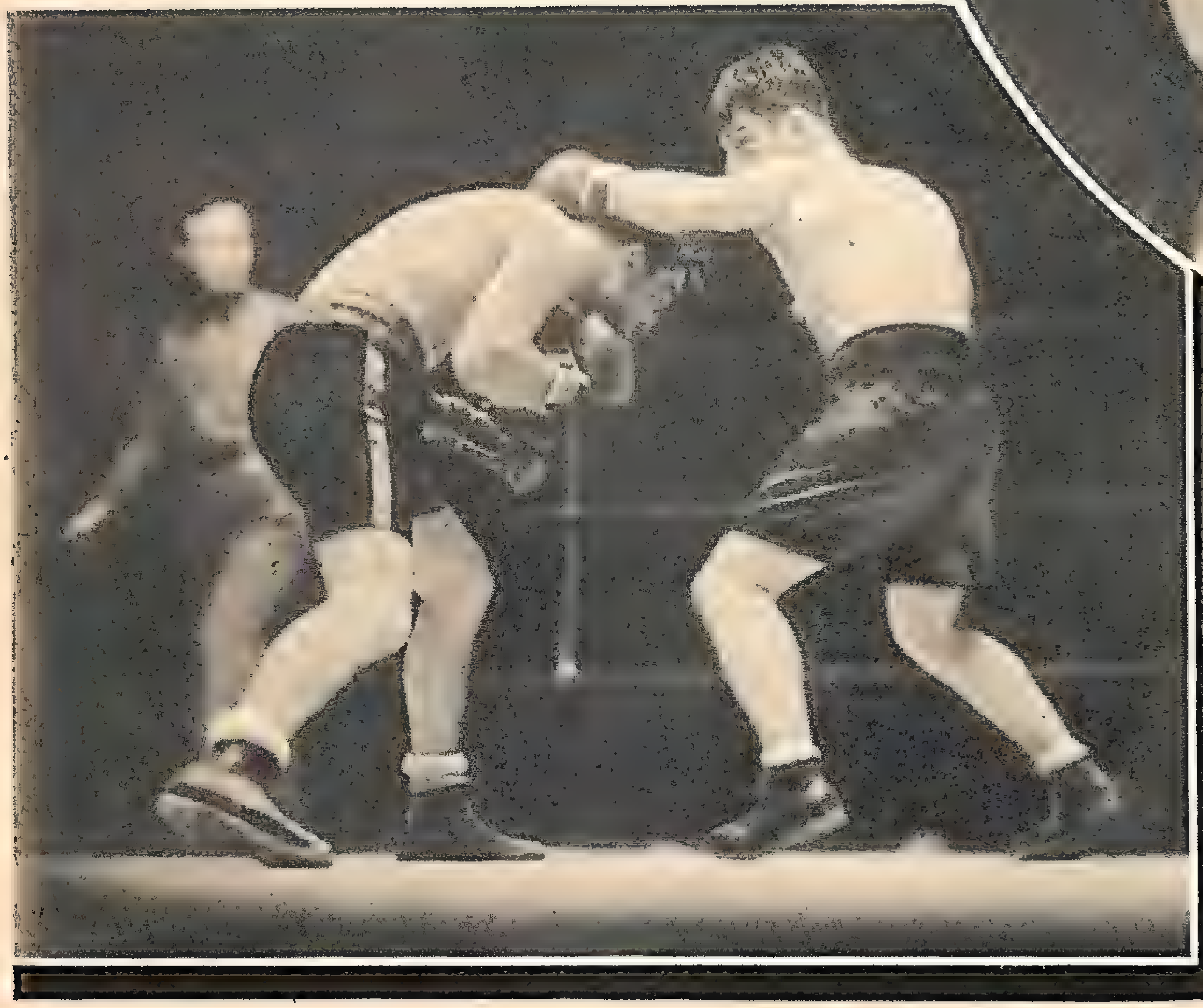


Left—Carnera struggles to rise, as the referee advises Baer to get into a neutral corner while the champion is still down. Using the Illinois system of scoring, Baer would score points for the knockdown, but he might lose them if he continued to disregard the referee's repeated warnings to get into a neutral corner. Failure to do this is considered as a breach of sportsmanship as it does not afford opponent a fair chance to regain his feet.

by **GEN. J. V. CLINNIN**

FORMER PRESIDENT
NATIONAL BOXING ASSOCIATION

Above—Gen. J. V. Clinnin, former president of the National Boxing Association, and author of this article on judging fights by point system.



Above—Billy Petrolle ducks under a fast left-hook delivered by Sammy Fuller. To many in the back of the audience, this may look like a clean blow, but to the referee and judges, it is obvious that it glanced ineffectively off the back of Petrolle's head.

inexperienced judges? Is it the referee? Is it because the fans are prejudiced? Let's see what is wrong and find out if there is a remedy.

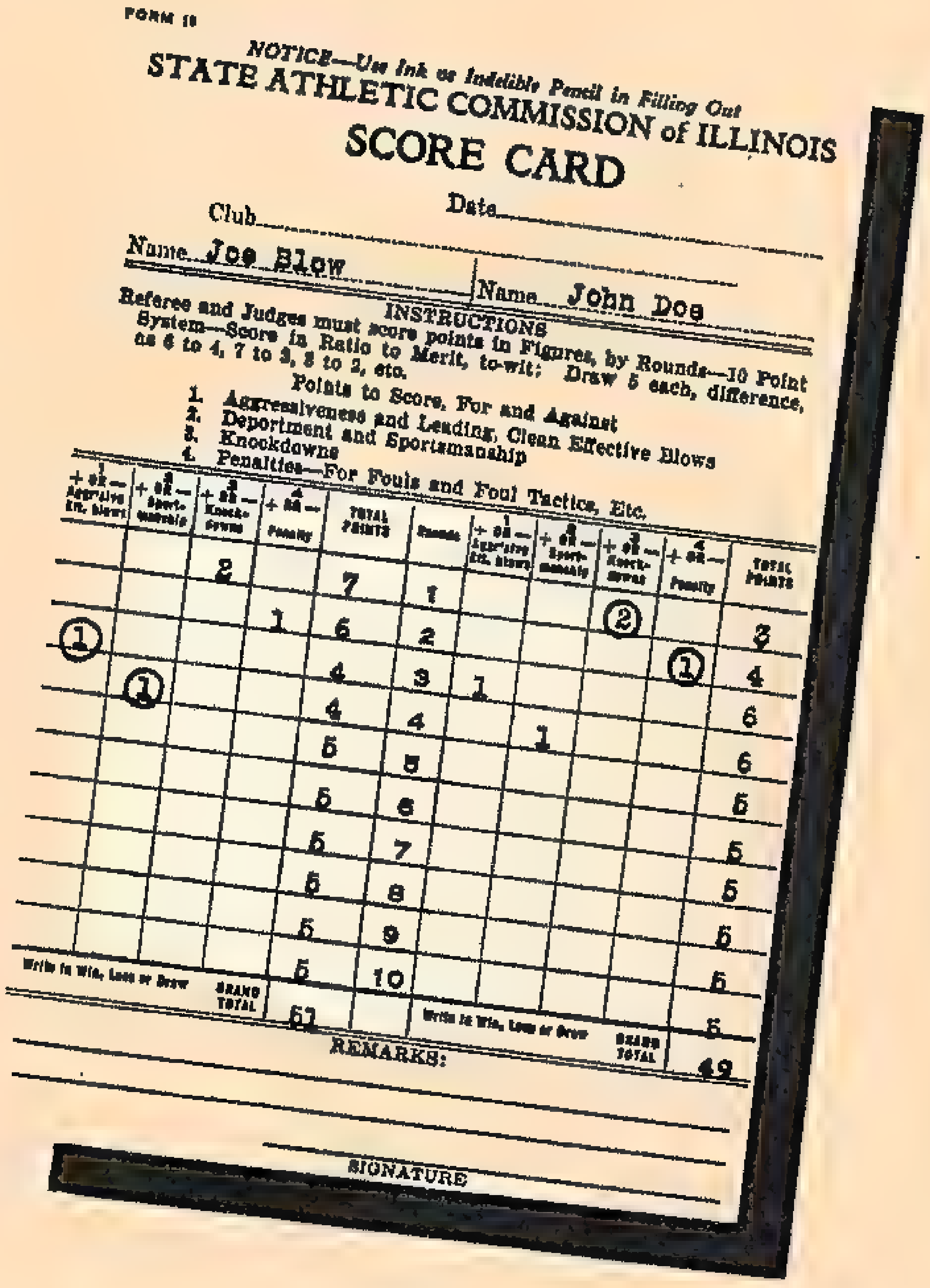
There are two major boxing centers, New York and Chicago. In New York, until recently, the system of scoring fights was solely by rounds. For some years, Chicago has employed what is the nearest approach to a perfect scoring system and New York is now experimenting with a similar plan.

In Chicago, the scoring system is one that came into vogue while I was chairman of the Illinois Boxing Commission. It was invented by Dave Barry, the referee, and William Battye, one of our most competent judges. I shall explain it briefly:

Each of the two judges and the referee is given a card on which are five columns for each boxer. The rounds represent units of ten points each; that is, five points, for each contestant in case of an even round. The columns and their classifications follow: 1. Aggressiveness, clean effective blows; 2. Deportment and sportsmanship; 3. Knockdowns; 4. Penalties—For fouls and foul tactics;

[*Continued on page* 120]

Below—A score of a mythical match between Joe Blow and John Doe. In the first round, Doe is penalized two points as he is knocked down. In the second, he loses a point for using a rabbit punch. He gains a point in the third for aggressiveness and one in the fourth when Blow uses abusive language to the officiating referee.



FORM 10

NOTICE—Use Ink or Indelible Pencil in Filling Out

STATE ATHLETIC COMMISSION of ILLINOIS

SCORE CARD

Club ______ Date ______

Name Joe Blow | Name John Doe

INSTRUCTIONS

Referee and Judges must score points in Figures, by Rounds—10 Point System—Score in Ratio to Merit, to-wit: Draw 5 each, difference, as 6 to 4, 7 to 3, 8 to 2, etc.

Points to Score, For and Against

1. Aggressiveness and Leading, Clean Effective Blows
2. Deportment and Sportsmanship
3. Knockdowns
4. Penalties—For Fouls and Foul Tactics, Etc.

1 + or — Aggressive Eff. blows	2 + or — Sportsmanship	3 + or — Knockdowns	4 + or — Penalty	TOTAL POINTS	Rounds	1 + or — Aggressive Eff. blows	2 + or — Sportsmanship	3 + or — Knockdowns	4 + or — Penalty	TOTAL POINTS
		2		7	1			②		3
			1	6	2				①	4
①				4	3	1				6
	①			4	4		1			6
				5	5					5
				5	6					5
				5	7					5
				5	8					5
				5	9					5
				5	10					5
Write in Win, Lose or Draw			GRAND TOTAL	61		Write in Win, Lose or Draw			GRAND TOTAL	49

REMARKS:

SIGNATURE

Light Beams Produce 1800 Organ Tones

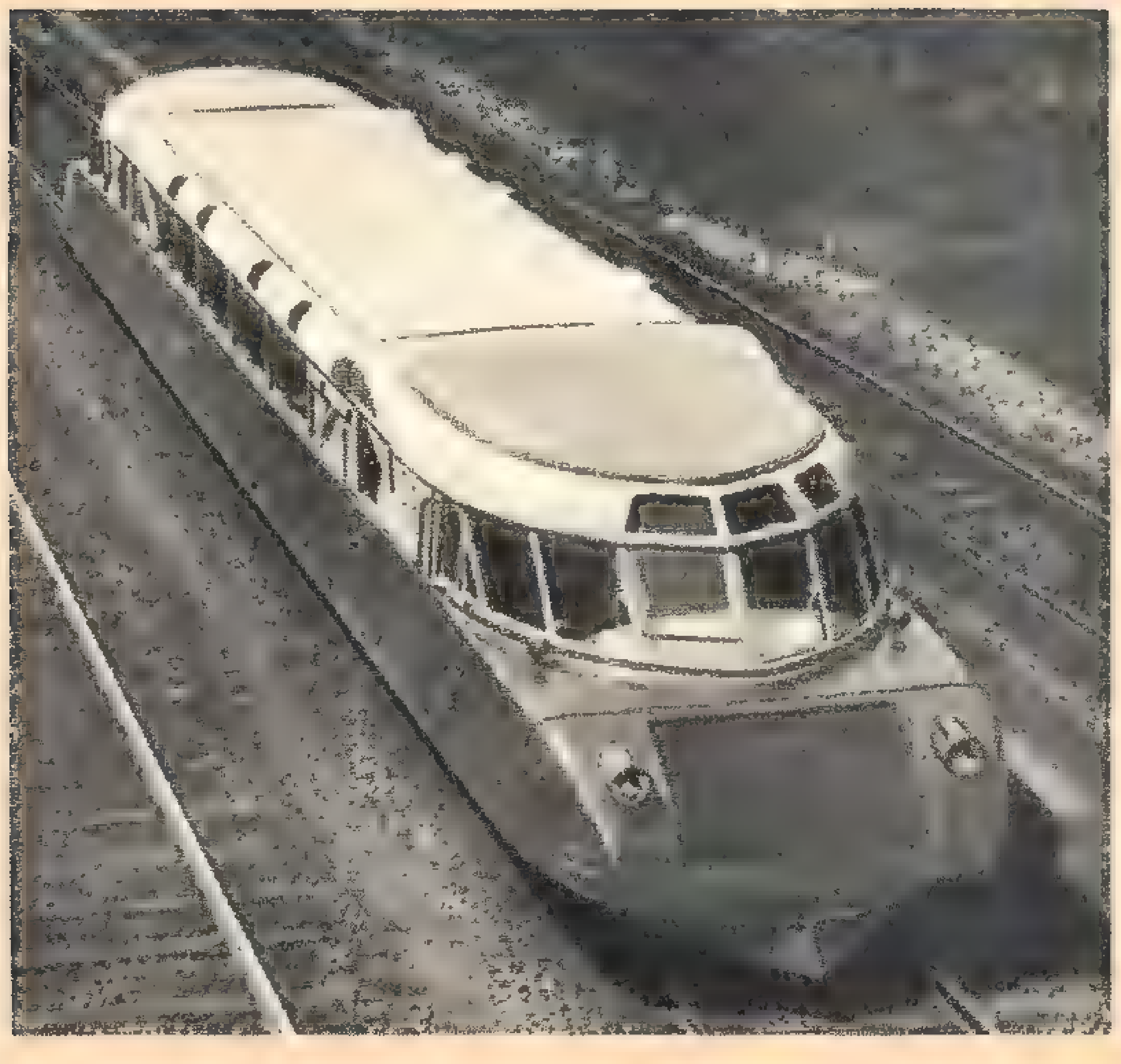
Photo shows Mr. Eremeeff and organist at the console of the organ. Organ tones are produced by broken light beams.

AN ELECTRONIC organ, invented by Ivan Eremeeff, Russian physicist, and Leopold Stokowski, renowned symphony director, produces 1,800 tones through the flashing of broken light beams onto photo-cells. Unlike the ordinary organs, it contains no reeds, pipes, strings, or phonographic records. Interrupted beams of light, broken on whirling discs, are flashed onto a photo-cell and transferred to electrical frequencies. These frequencies are amplified and reproduced as sound.

The organ has two keyboards and two banks of stops to control the 1,800 tones. Mixing of the stops brings forth a variety of unusual effects. The mechanism will not get out of tune and is not affected by temperature and weather changes. Since all the parts are direct products of the radio, it is expected that building organs will open new fields for radio industries.

Rail Car Runs On Rubber Tires

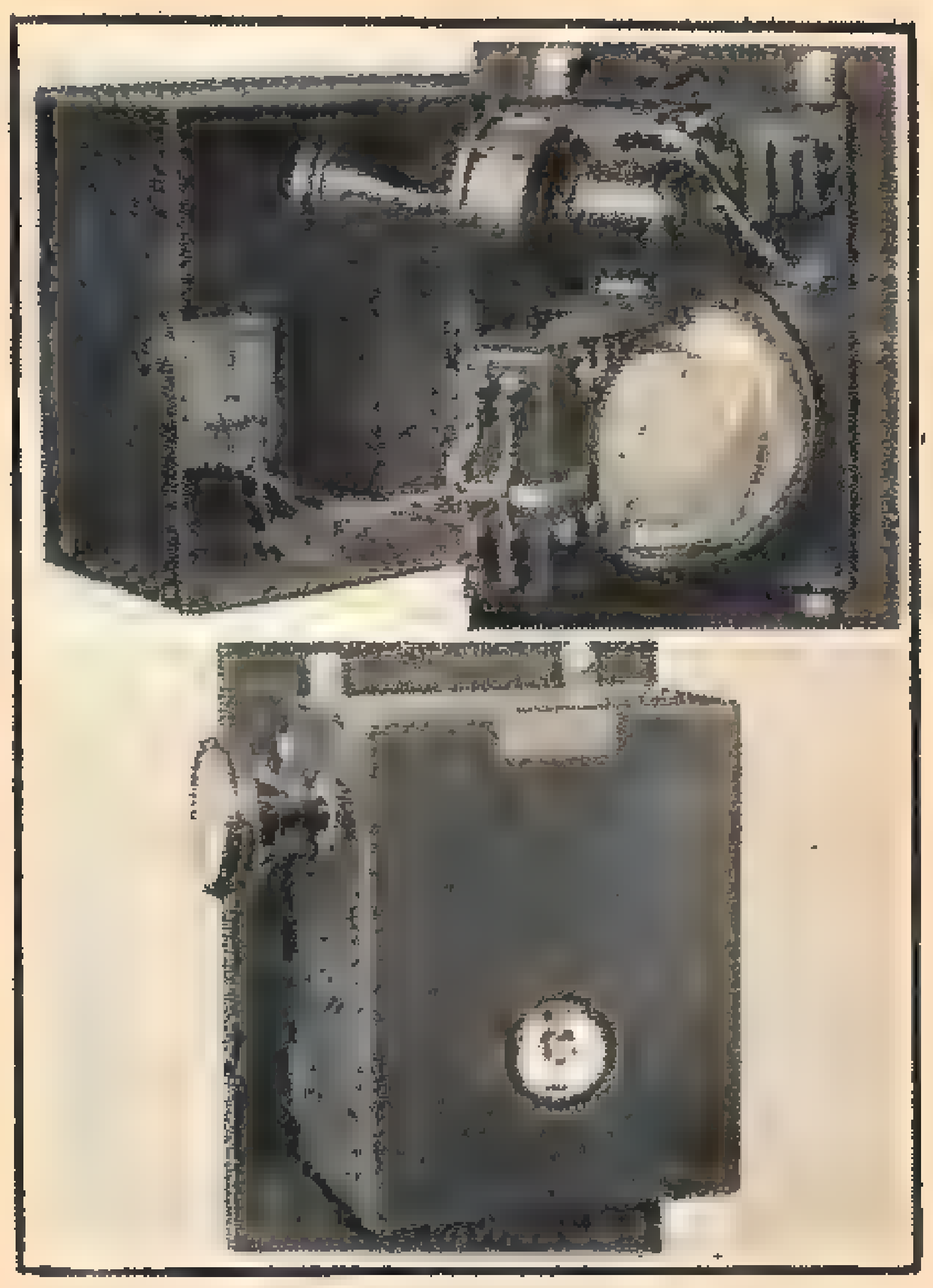
"SILENT speed" is the feature of the new railroad motor cars used in Austria for quick handling of light traffic. Low, streamlined, and set on rubber-tired wheels, these new cars whiz silently over the rails at a rate of 70 miles per hour. The cars are 75 feet long, weigh 34,000 pounds, and are driven by a motor that will develop one hundred horsepower.



The Austrian streamlined rail-car is mounted over rubber tired wheels and travels at a maximum speed of 70 m. p. h.

Alarm Rings As Gas Gets Deadly

A LOUD gong on a new carbon monoxide alarm is set to ring its warning before this colorless, odorless, tasteless gas becomes dangerous to human life. Reliable tests show that the alarm rings when the poison gas content of air reaches two parts in 10,000.



The alarm rings when the gas content of air is two parts in 10,000.

Plane Drops Machinery In Chutes

PARACHUTES were introduced into the delivery of machine parts when they were used to drop mining machinery to an inaccessible mine near Valdez, Alaska. The machinery was wrapped in mattresses and dropped in chutes from a height of 300 feet.

Adjustable Club Makes Golf Bags and Caddies Unnecessary

THE expenses of the ancient game of golf may be considerably reduced if the invention of Charles A. Rolfe of Beverly Hills, Calif. proves practical.

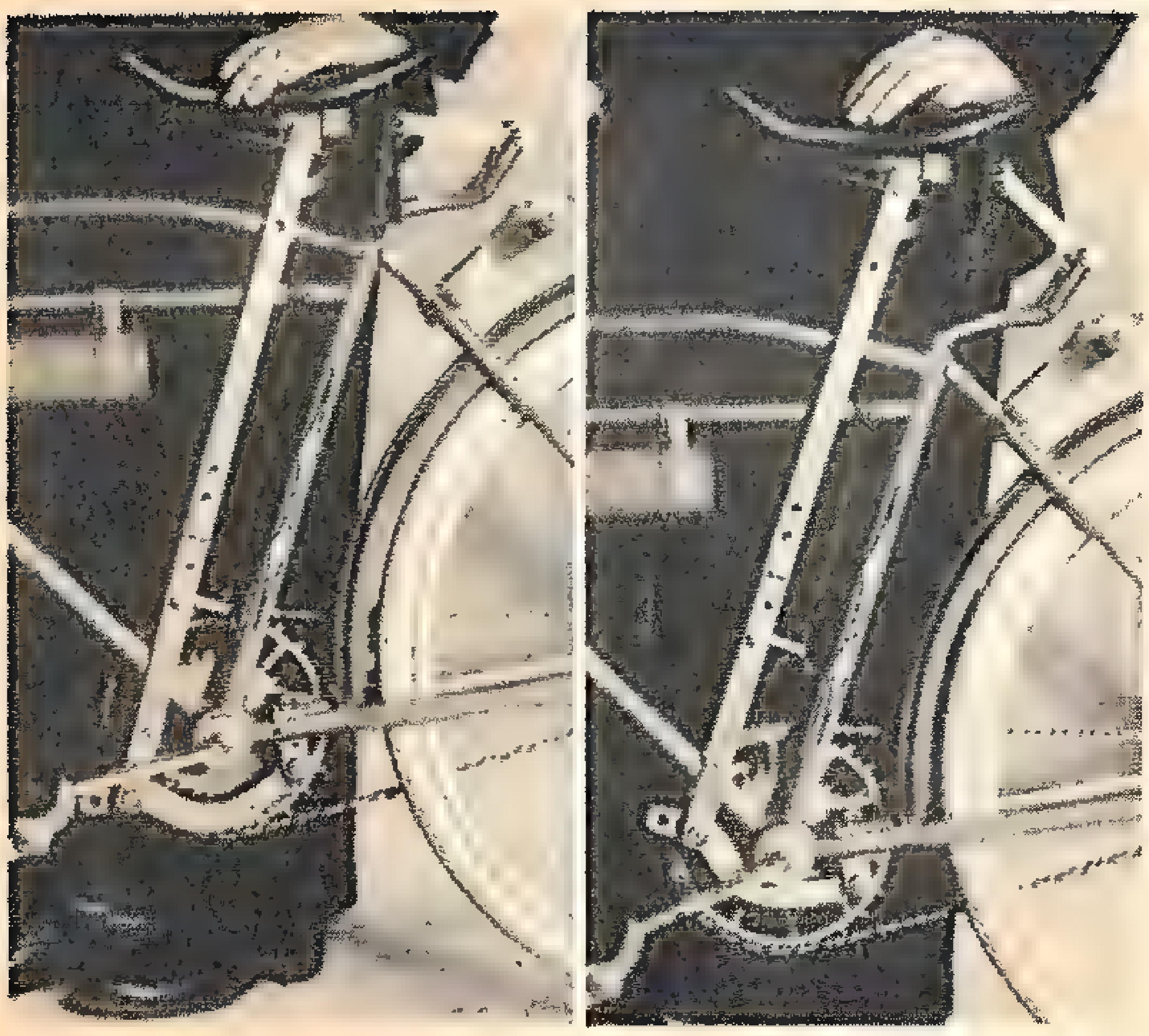
The invention is an all-purpose golf club which aroused considerable attention at the National Inventor's Congress recently held in Hollywood. The use of this club is said not only to eliminate unnecessary caddy expenses but also to cut equipment charges down to the cost of a single club and a few balls.

The head of the club has a plain, flat putter surface, and it is attached to the handle by a swivel joint. The swivel joint can be loosened so that the pitch of the club-head may be adjusted to the proper angle for any desired shot now made with various clubs. After adjustment, the head is locked in place.

The handle of the club comes in two sections and may be taken apart and fitted into a small space when not in use.

Photo shows Miss Viola Kivett holding the new golf club. The head can be adjusted to proper position for any golf shot.

Body Weight Raises Bike Speed



Left—Weight on the seat forces down the lever to propel sprocket gear. Right—When weight is released, seat rises.

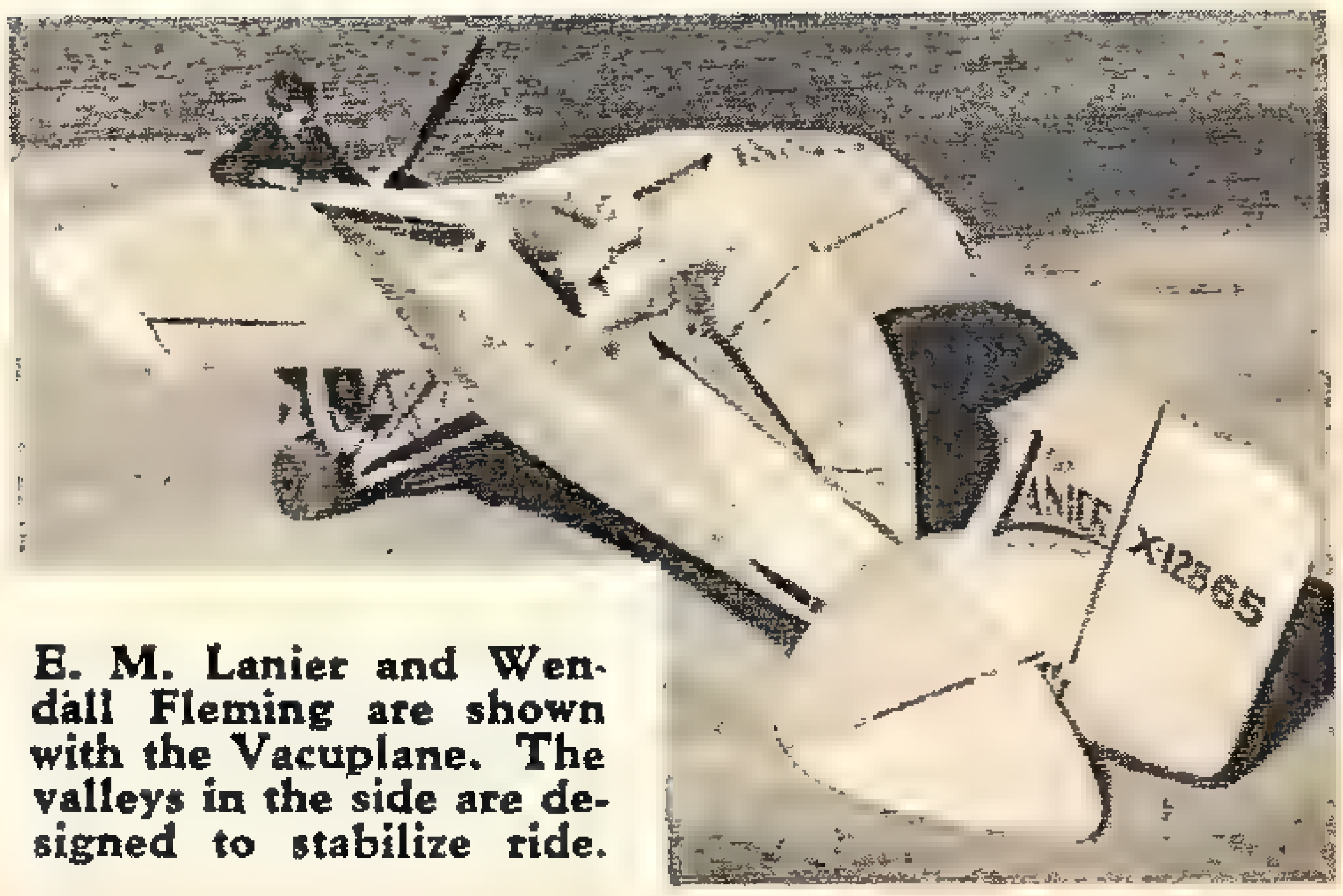
A BICYCLE power seat that springs up and down as the bicycle is pedaled has an attachment to a gear on the sprocket and utilizes the weight of the rider to produce additional power and speed.

The seat is attached to a long lever that runs to the gear on the sprocket. At the down-stroke of the pedal, the ratchet seat rises under the body. At the end of the downward pedal stroke, the weight of the body is thrown fully into the seat, forcing down the lever which in turn impels the attached gear.

Wing Valleys Stabilize Air Ride

PERHAPS the oddest aircraft that ever actually left the ground was demonstrated at the annual All-American air races recently held at Miami, Florida.

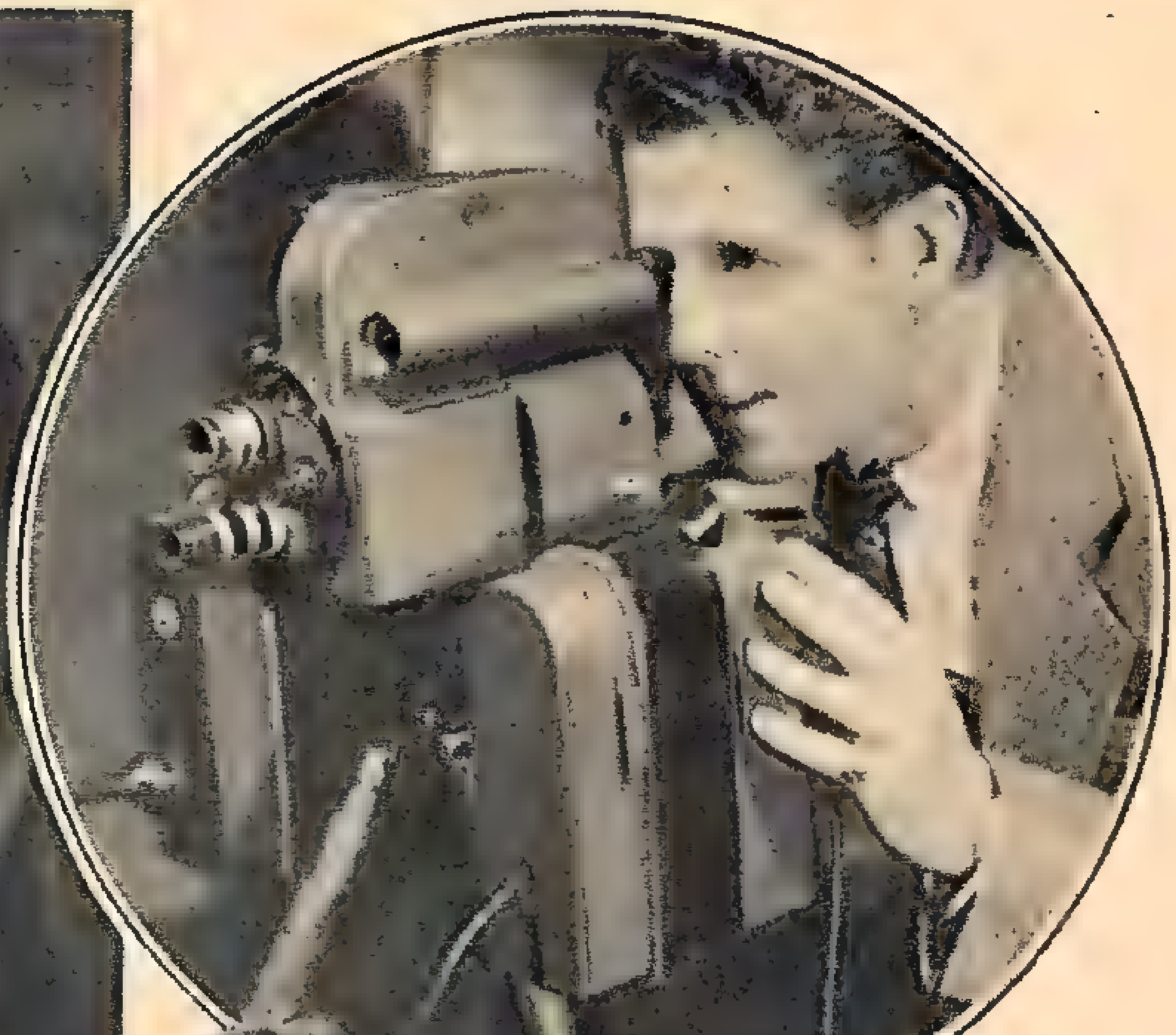
The plane, known as the Vacuplane, is only 16 feet long with short, stubby wings that appear as though they were clipped in the middle. It is of open cockpit construction and has shallow valleys running from the front of the wings to the middle of the fuselage which are designed to stabilize the air ride. The plane weighs but 350 pounds and develops a top speed of approximately 96 miles per hour.



E. M. Lanier and Wendall Fleming are shown with the Vacuplane. The valleys in the side are designed to stabilize ride.

New Talkie Machine Makes Home Sound Movies Possible

How "talkie" movies are made at home with actor speaking into microphone on end table at his right is shown above. At right—Photographer speaks into mouthpiece built into camera, his voice vibrating a thin metal diaphragm which is coupled to a tiny mirror. Light beam on mirror is reflected to sensitized edge of film to form sound track. Sound changes make fluctuations in film record.



At left: Rudy Vallee speaks into mouthpiece at back of new "talkie" camera, recording on film running account of event being photographed. In circle: Close-up of camera and sound recorder on tripod, as used in recording sound effects. Weight of equipment is 20 pounds. With microphone, 110 volt a. c. power is used.

ANYONE can now make "talkie" movies at home with the introduction by R. C. A. of the first amateur sound camera. Though differing in size only slightly from the average amateur movie camera, the new "talkie" camera incorporates a complete sound recording system and weighs only 8¾ pounds fully loaded.

The photographer talks into a mouthpiece built into the back of the new camera, as he focuses on the subject, to give a running description of the scene. When the actors speak for home movies, a separate microphone attachment with electrical amplifying and recording equipment is used.

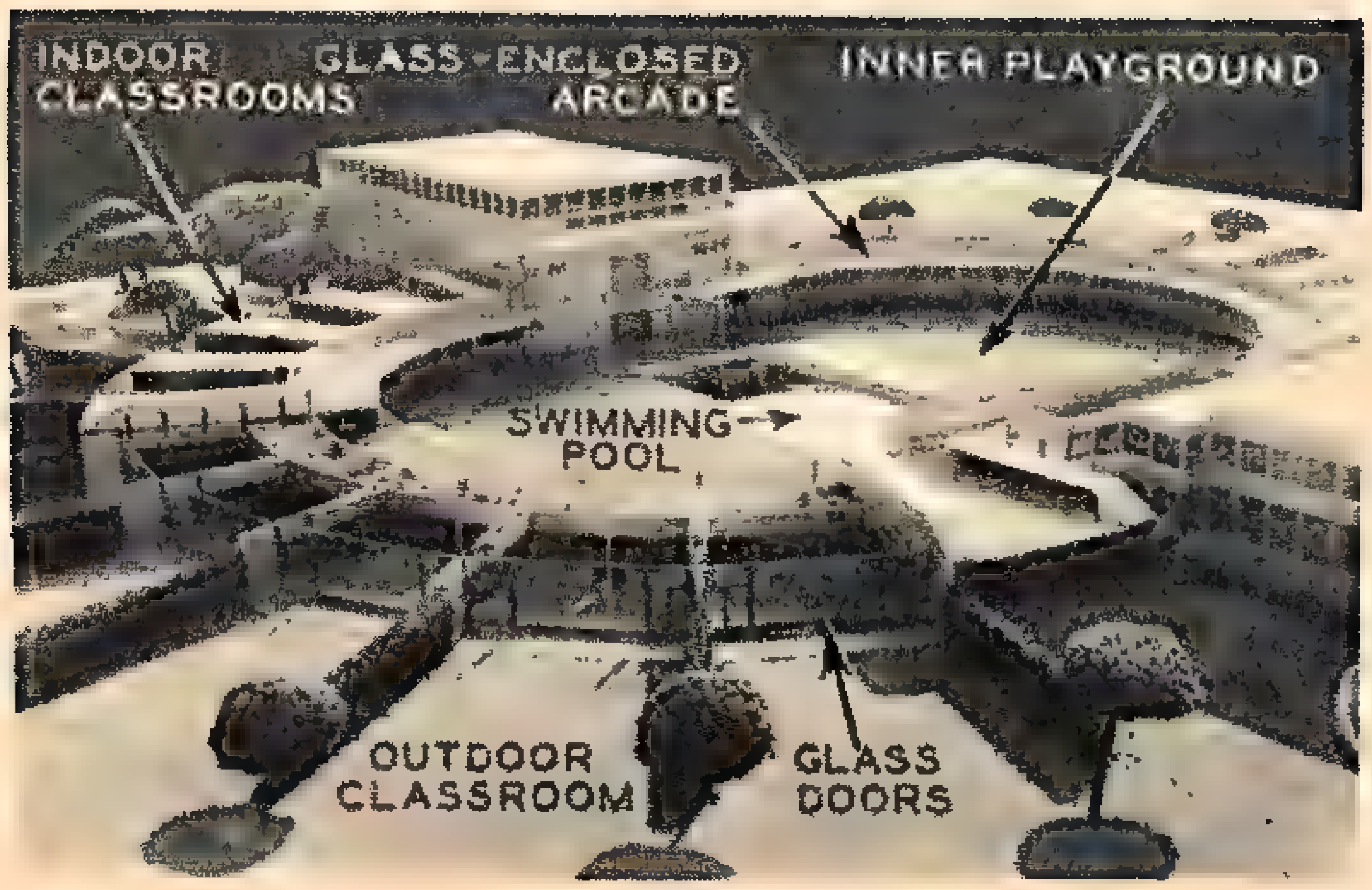
The 16 millimeter film used has sprocket holes on one side, a sound track on the other.

School Built To Please Children

INDOOR and outdoor class rooms are now being combined and built around a huge playground and swimming pool in a new experimental school now being built in Los Angeles.

Built to induce the children to go to school because they want to rather than because they have to, classes will be conducted out-of-doors when the weather permits.

Ten classrooms will be built to form a semi-circle on each end. The sides will be completed with administrative offices and manual training rooms.

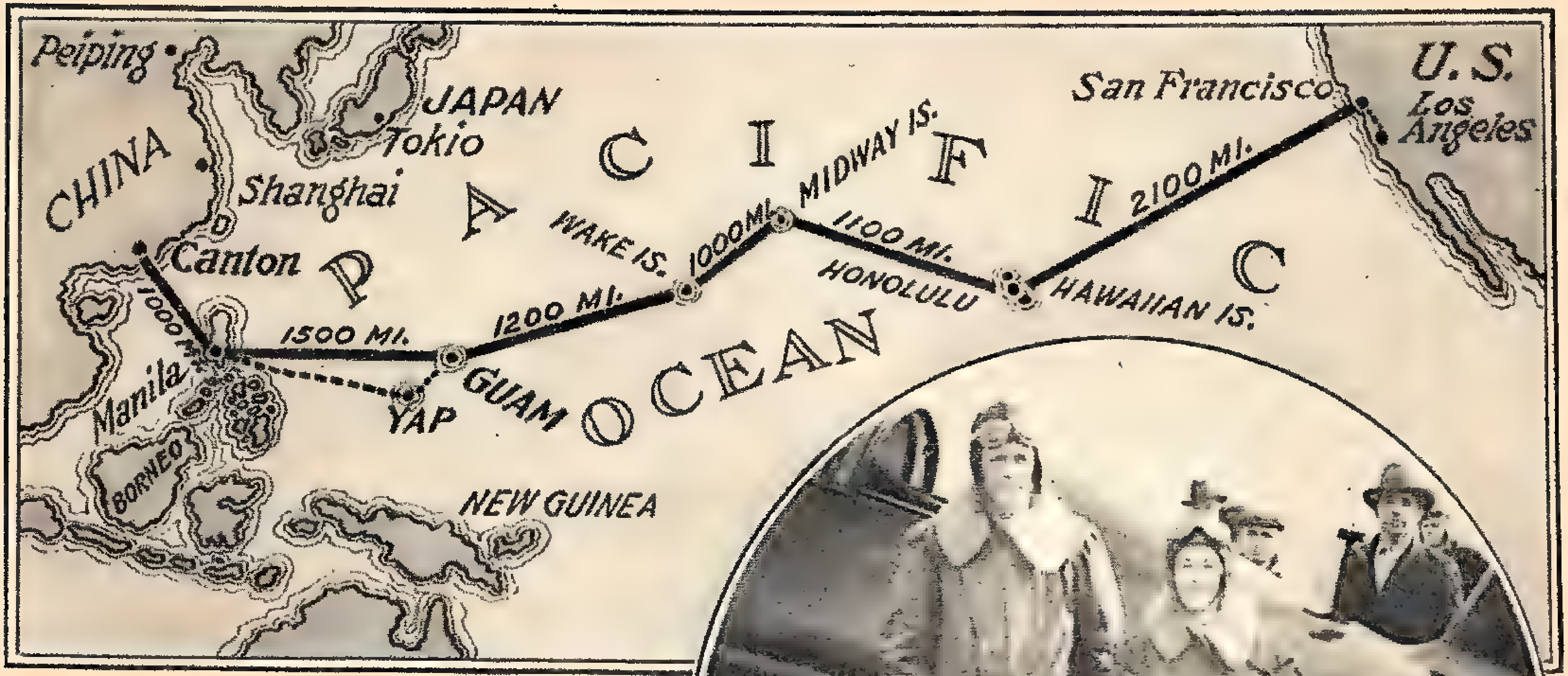


Above—The new Los Angeles school will be built around a playground. The ceilings of the rooms will radiate heat.

Eye Makes Body's Only Vitamin

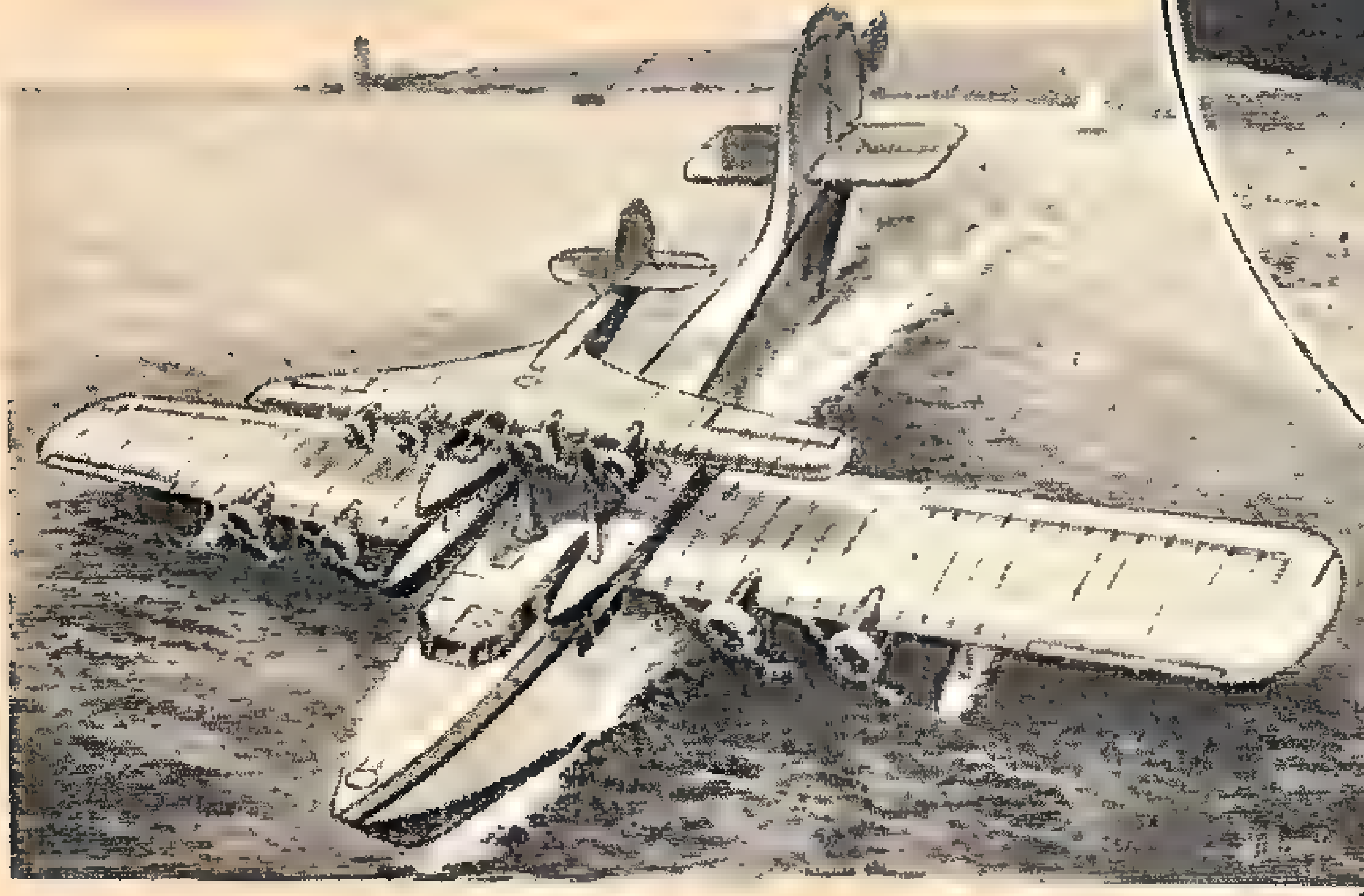
THE only vitamin made in the human body is a carotene-like, vitamin A secreted in the retina of the eye. Without this substance, the eye would lose its health with "night blindness" or total blindness resulting.

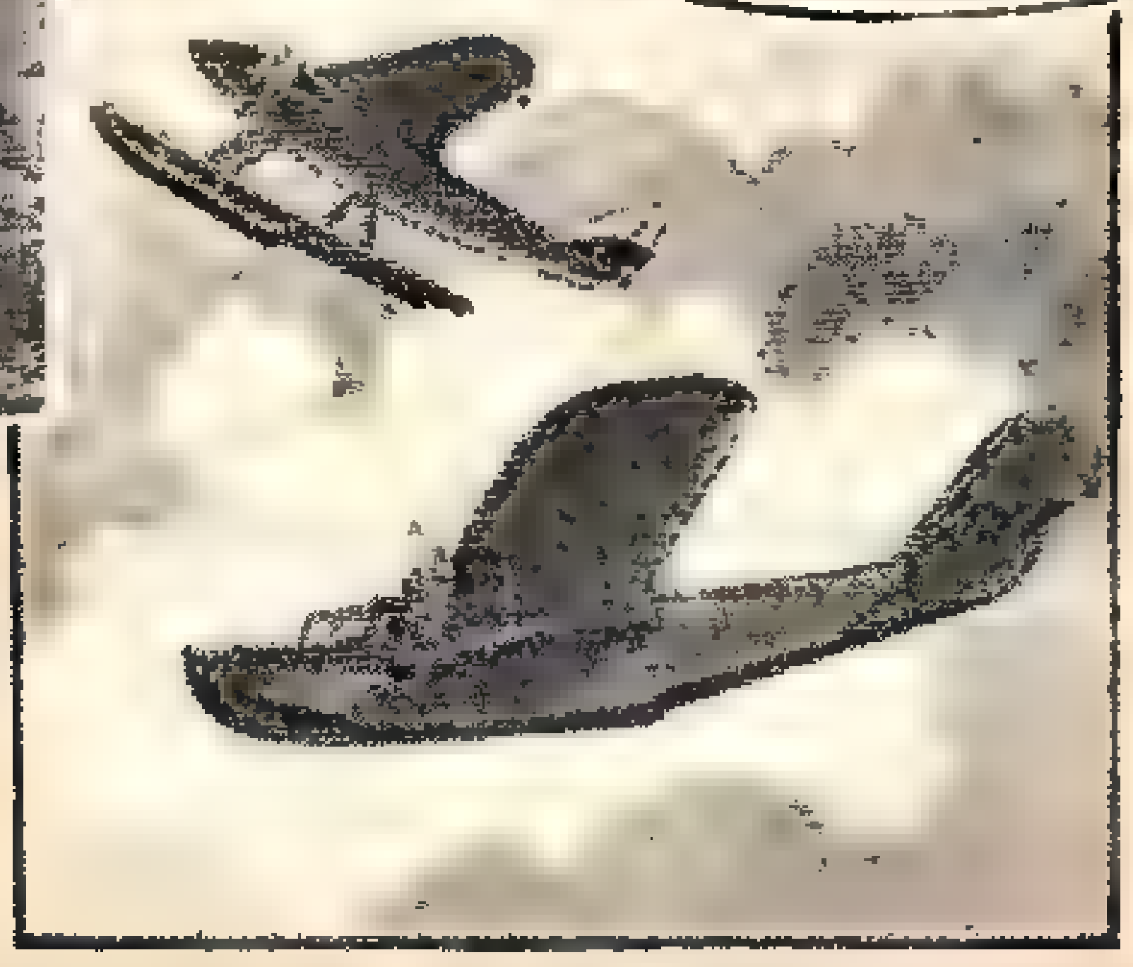
Design GIANT Planes for Ocean Routes


Peiping
JAPAN
Tokio
CHINA
Shanghai
Canton
PACIFIC OCEAN
WAKE IS.
MIDWAY IS.
1000 MI.
1100 MI.
HONOLULU
HAWAIIAN IS.
2100 MI.
San Francisco
U.S.
Los Angeles
1500 MI.
1200 MI.
1000 MI.
Manila
YAP
GUAM
BORNEO
NEW GUINEA

Col. Lindbergh, technical adviser for Pan American Airways, is expected to be the first to make a test flight over the above 9,000-mile trans-Pacific route.

Col. Lindbergh and his wife (above) may fly together over route linking California and the Orient. A 60-hour flying schedule is planned by Pan-American.





England's new "composite airplane" for the Atlantic route. Giant mother ship will lift smaller sea transport, then release it, as shown at right, after takeoff for ocean flight.

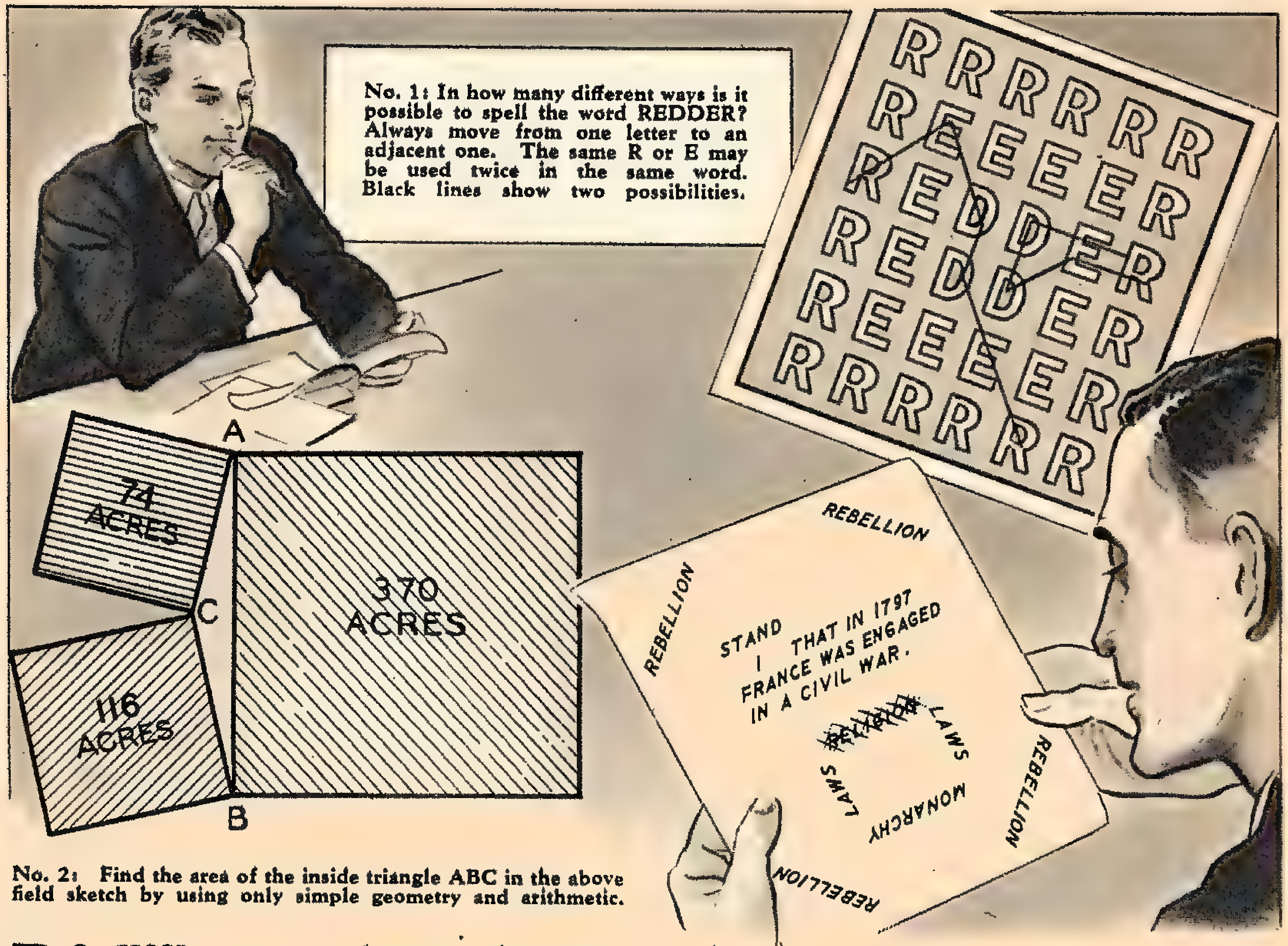
ESTABLISHMENT of regular air schedules across the Atlantic and Pacific oceans is expected to take place this summer.

Col. Charles A. Lindbergh may be the first to fly the transport route across the Pacific in Pan-America's new giant Clipper No. 7. On the other hand, Great Britain threatens to be first to make commercial flying over the Atlantic possible with a new "composite airplane."

Destined for Trans-Pacific service this giant Clipper No. 7 can carry 14 passengers, ton of cargo, and holds fuel for a 3,000-mile flight. The ship itself weighs 25 tons.

The composite airplane is the invention of Major R. H. Mayo, technical adviser for Imperial Airways. It consists of a mother ship and a smaller plane. At the point of take-off in England the smaller ocean plane will be perched on top of and fastened rigidly to the mother ship. Each ship has four motors. Heavily loaded with fuel, passengers, and cargo, the ocean transport could not take off under its own power, but with the combined effort of eight motors on the two ships, it is expected to rise easily. At an altitude of 5,000 feet the mother ship will release the transport to return to the air base while the transport continues on its flight across the sea.

CASH for PUZZLE Solutions;



No. 1: In how many different ways is it possible to spell the word REDDER? Always move from one letter to an adjacent one. The same R or E may be used twice in the same word. Black lines show two possibilities.

No. 2: Find the area of the inside triangle ABC in the above field sketch by using only simple geometry and arithmetic.

No. 3: What is the message shown on above sheet of paper?

DO YOU enjoy working mathematical puzzles—secret messages—letter combination problems? Try your luck at the three given above, send in your solutions, and you stand a good chance to win part of the $25.00 in cash prizes offered this month.

Place your solutions all on a single sheet of paper, making them as neat as possible. Elaborate, artistic entries will receive no more consideration than those clearly written in longhand or typed.

Here's a tip that may save tedious counting in the first problem—work it backward, starting at the center of the word REDDER.

There's no need to extract square roots in working problem 2—in fact, it's not allowed in the solution. Your grammar school arithmetic and a little reasoning will get the answer.

A little review of French history will be of help in reading the secret message in No. 3. This tip may put you on the right track: "Laws were set aside."

For the most accurate solutions to all three puzzles MODERN MECHANIX AND INVENTIONS offers $25.00 in prizes, as follows: First prize, $10; second, $5; and four third prizes of $2.50 each.

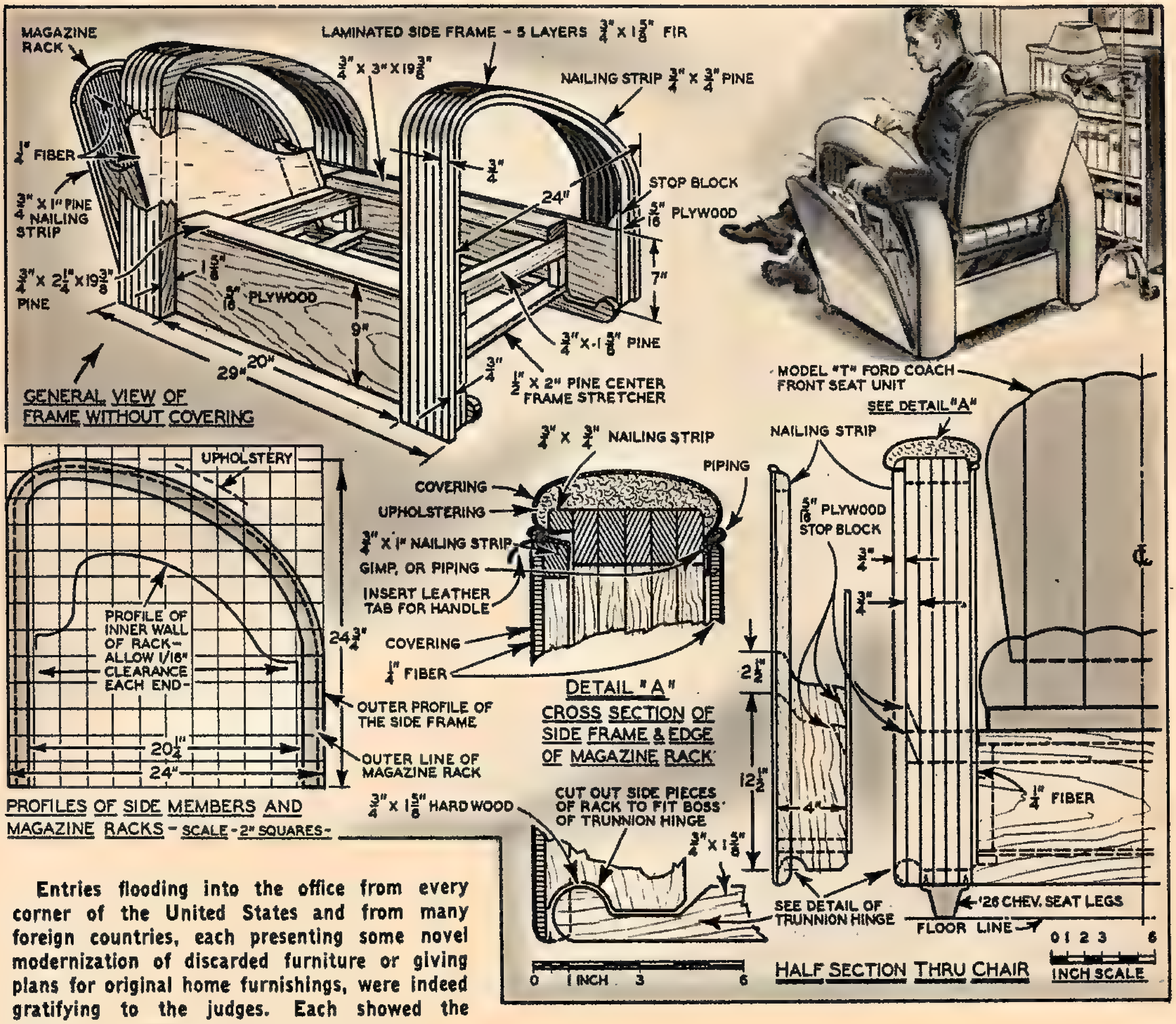
Contestants should give age, occupation, and education, though this information will not be considered in awarding prizes.

Your entry should be postmarked before April 25, 1935. Decisions of the judges will be final, and no entries will be returned. In case of ties, duplicate prizes will be awarded. Answers to these problems and names of the winners will appear in the July issue.

Employes of this magazine or their relatives are not eligible to compete. You don't have to buy a copy or be a subscriber to enter. Address Puzzle Contest, MODERN MECHANIX AND INVENTIONS, 529 So. 7th St., Minneapolis, Minnesota.

Send in your own puzzles for future contests. If accepted, you will receive payment at our regular rates for such manuscripts. No puzzles will be returned.

CONTEST WINNERS GET $125


MAGAZINE RACK
LAMINATED SIDE FRAME - 5 LAYERS 3/4" x 1 5/8" FIR
3/4" x 3" x 19 3/8"
NAILING STRIP 3/4" x 3/4" PINE
1/4" FIBER
3/4" x 1" PINE NAILING STRIP
3/4
STOP BLOCK
24"
5/16" PLYWOOD
3/4" x 2 1/4" x 19 3/8" PINE
1 5/8"
5/16" PLYWOOD
7"
9"
3/4" x 1 5/8" PINE
20"
29"
3/4"
1/2" x 2" PINE CENTER FRAME STRETCHER
UPHOLSTERY
PROFILE OF INNER WALL OF RACK- ALLOW 1/16" CLEARANCE EACH END-
24 3/4"
OUTER PROFILE OF THE SIDE FRAME
20 1/4"
24"
OUTER LINE OF MAGAZINE RACK
3/4" x 3/4" NAILING STRIP
COVERING
UPHOLSTERING
3/4" x 1" NAILING STRIP
GIMP, OR PIPING
INSERT LEATHER TAB FOR HANDLE
PIPING
COVERING
1/4" FIBER
3/4" x 1 5/8" HARDWOOD
CUT OUT SIDE PIECES OF RACK TO FIT BOSS OF TRUNNION HINGE
3/4" x 1 5/8"
0 1 INCH 3 6
MODEL "T" FORD COACH FRONT SEAT UNIT
SEE DETAIL "A"
NAILING STRIP
5/16" PLYWOOD STOP BLOCK
3/4"
3/4"
2 1/2"
12 1/2"
4"
1/4" FIBER
'26 CHEV. SEAT LEGS
SEE DETAIL OF TRUNNION HINGE
FLOOR LINE
0 1 2 3 6
INCH SCALE

GENERAL VIEW OF FRAME WITHOUT COVERING

PROFILES OF SIDE MEMBERS AND MAGAZINE RACKS - SCALE - 2" SQUARES -

DETAIL "A" CROSS SECTION OF SIDE FRAME & EDGE OF MAGAZINE RACK

HALF SECTION THRU CHAIR

Entries flooding into the office from every corner of the United States and from many foreign countries, each presenting some novel modernization of discarded furniture or giving plans for original home furnishings, were indeed gratifying to the judges. Each showed the popularity of MM contests among readers.

After careful consideration of each of the entries from the standpoint of ingenuity and practicality, the judges, editors of Modern Mechanix and Inventions, awarded first prize of $60.00 to Paul E. Miller of Casper, Wyoming. Mr. Miller's winning entry, an arm chair built from an auto seat, is reproduced on this page, while instructions for building this chair follow.

by PAUL E. MILLER

THE folding front seat of a Model T Ford coach, having lines very similar to that of modern furniture, serves admirably as the seat of this combination arm chair and magazine rack. A simple wood frame, made with ordinary carpentry tools and a scroll or band saw, holds the seat rigidly in position. Gracefully curving side arms conceal, on each side,

[*Continued on page* 152]

FURNITURE CONTEST WINNERS

Selected by the judges as winners in the January, 1935 Modern Mechanix and Inventions Furniture Contest, the following persons receive the $125.00 in cash prizes offered for this contest.

FIRST PRIZE, $60.00: Paul E. Miller, Casper, Wyoming. His winning entry appears on this page.

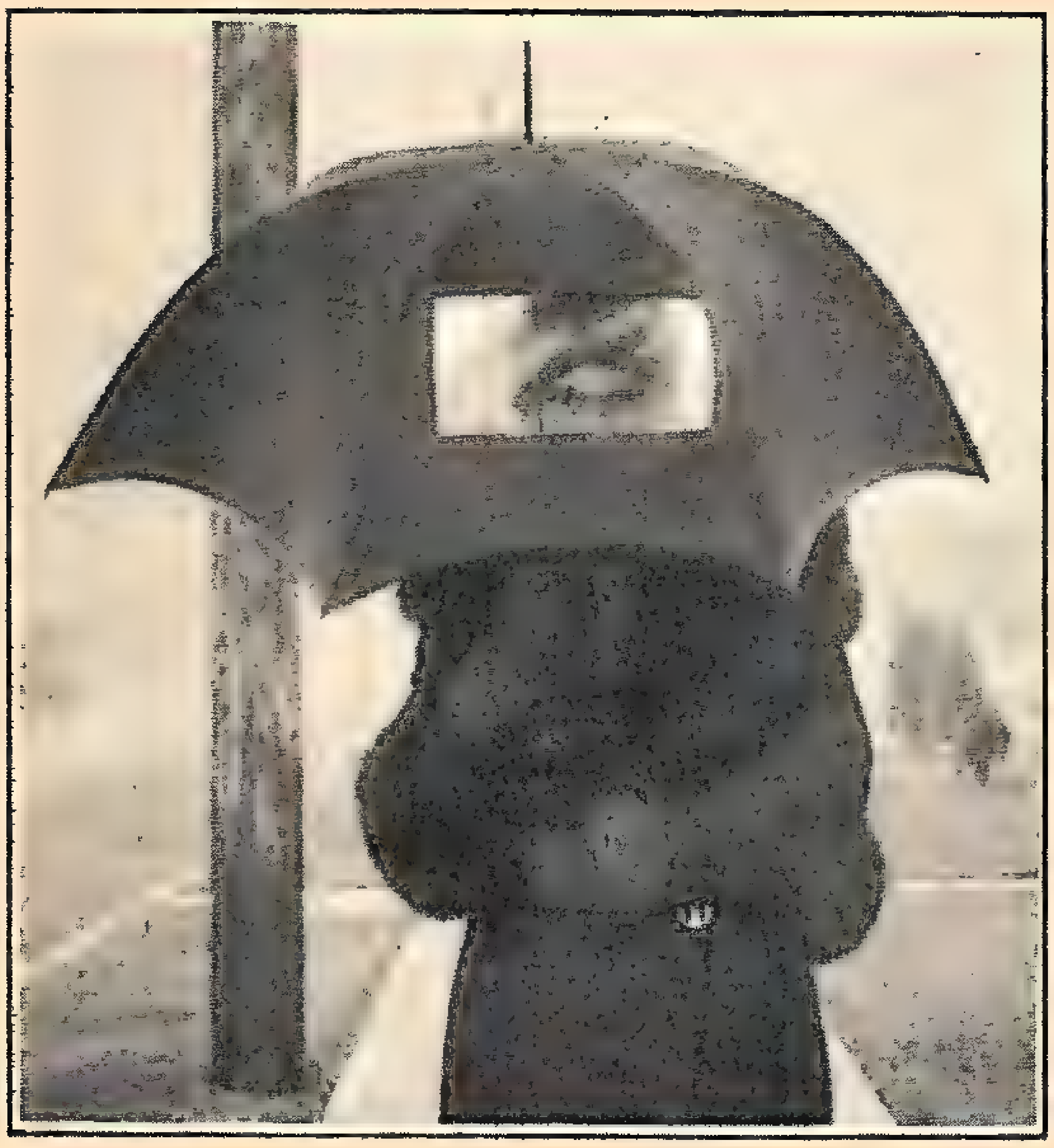
SECOND PRIZE, $20.00: Ira Edwards, Neodesha, Kansas—a modernization of the old-fashioned davenport.

THIRD PRIZE, $8.00: Glenn E. Miller, Alpena, South Dakota—a buffet made from two upright phonograph cabinets.

FOURTH PRIZE, five awards of $5.00 each: Bates Jex, Pittsfield, Illinois—a smoking stand; W. A. Marshall, E. Toronto, Ontario, Canada—converting the victrola into a Governor Winthrop desk; Carl A. Schacht, Detroit, Michigan—design for a desk; H. R. Wallin, Brooklyn, New York—a cabinet for the home aquarium; Leon E. Desaultes, Indianapolis, Indiana—a portable radio bar.

FIFTH PRIZE, six awards of $2.00 each: John G. Diehl, Bristol, Pennsylvania; Olive A. Morris, Cape May Court House, New Jersey; Mrs. Wm. Shackleton, Wayzata, Minn.; H. W. Orr, Topeka, Kansas; Louise Shifter, Howard Lake, Minn.; Ernest J. Coons, Crawfordsville, Indiana.

Umbrella Follows Modern Trend With "Safety" Window



The new umbrella window consists of a piece of isinglass set into the front to afford the user clear vision ahead.

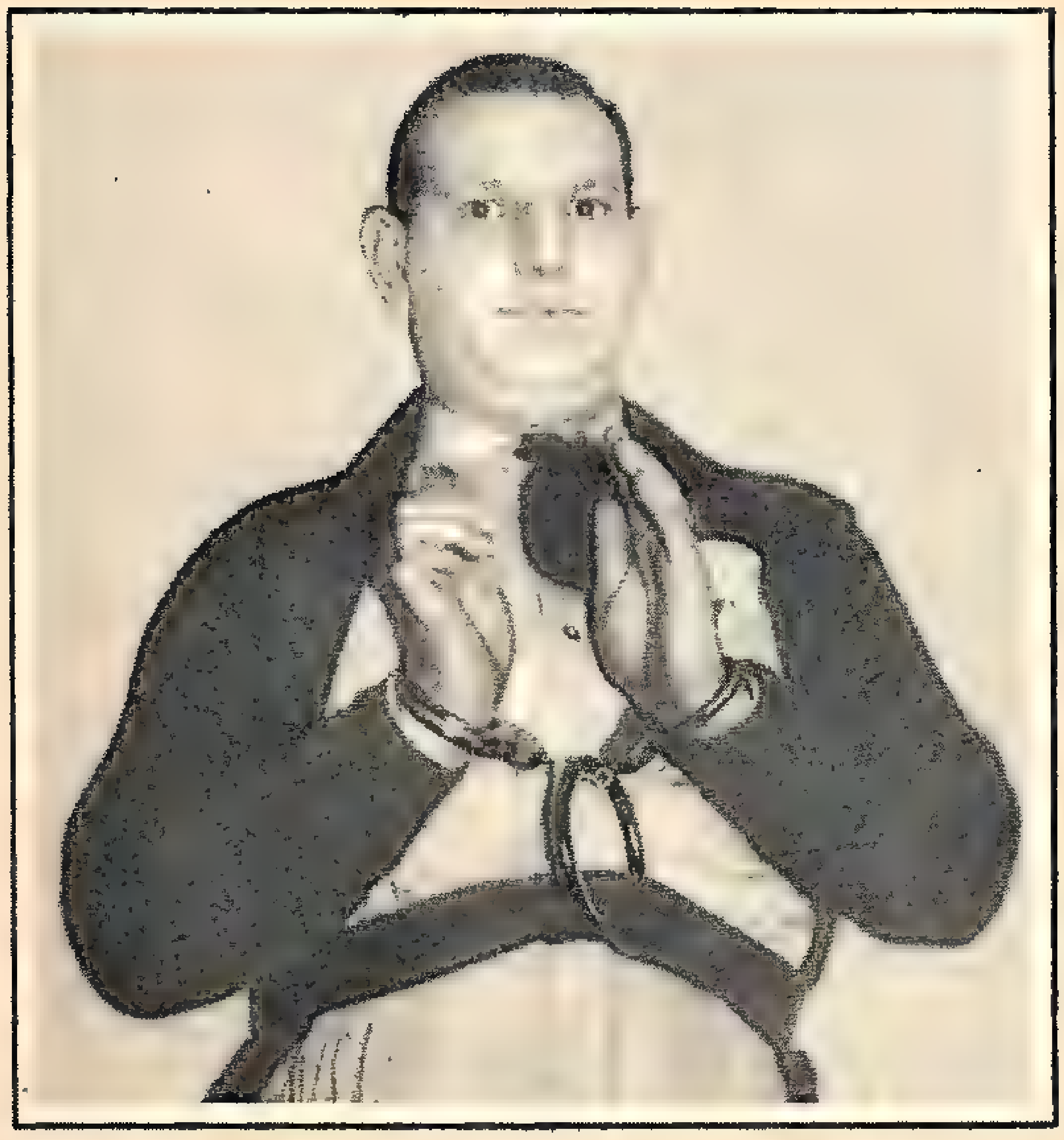
THE old umbrella, for ages untouched by the forward moving wheels of progress, has responded to the spirit of the times with the addition of a new front window to afford better vision.

Hitherto, the umbrella user either had to carry his umbrella so high that it was of no practical use, or he pulled it down and took reckless chances of collision with oncoming pedestrians.

The new isinglass window eliminates these hazards, and affords a chance for people to use their umbrellas to shed the rain without fear of poking out the eyes of a fellow citizen.

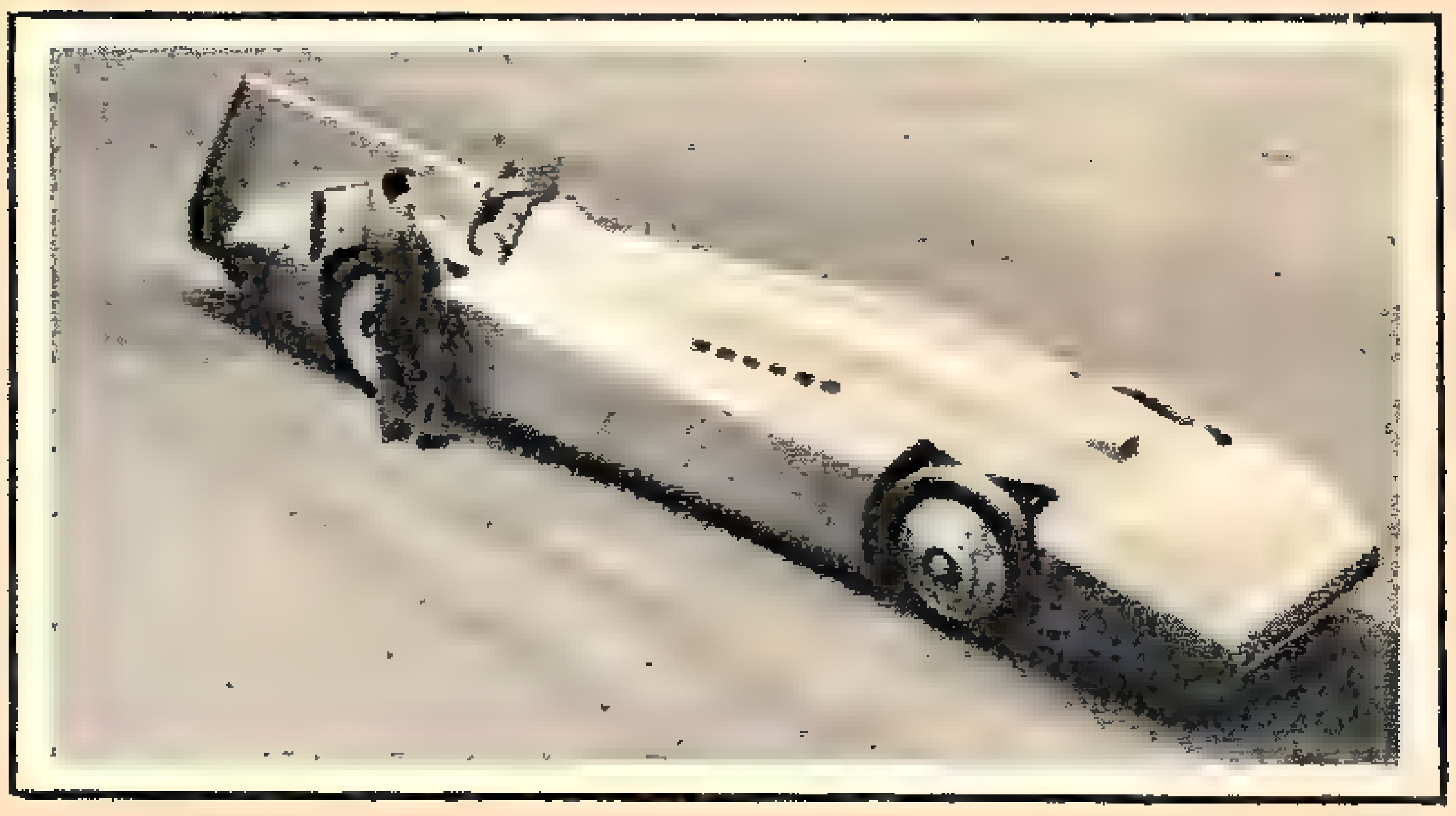
Harness Prevents Running Escape

A HANDCUFF harness which prevents a prisoner from running away has been devised by Guy E. Lombard, Portland, Maine jailer. The harness consists of a steel ring held to the prisoners' waist by a stout leather belt. The handcuffs are fastened to the belt, holding the prisoner's hands so close to his body that he cannot gain balance to run.



Edward Brown is shown demonstrating the handcuff harness which prevents the prisoner from gaining balance to run.

Campbell To Attempt Record Run



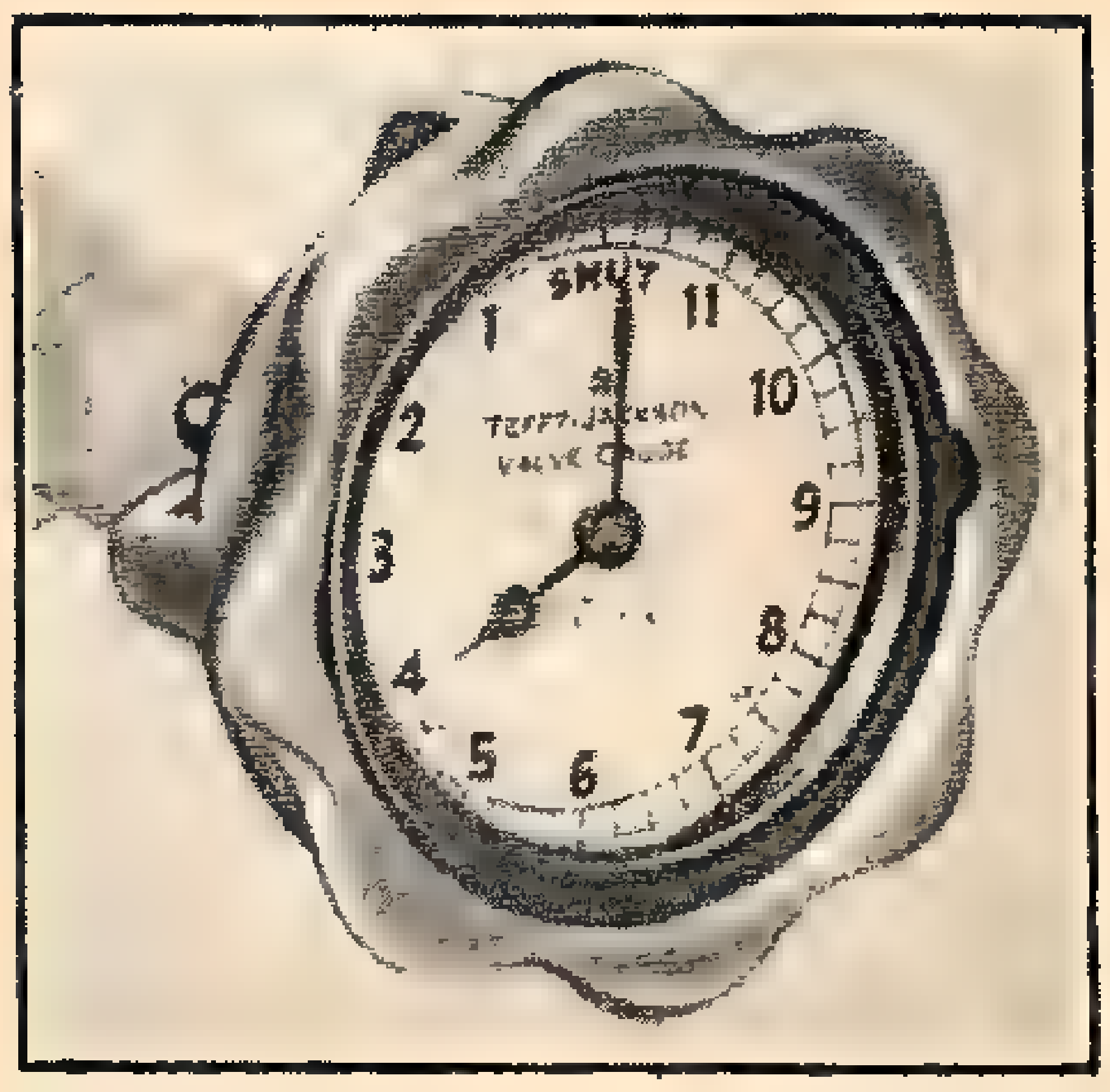
Above—Campbell is shown driving the Bluebird, the rebuilt racer with which he will attempt to break his land speed record.

FLAT, streamlined, and swung low to the ground, Sir Malcolm Campbell's rebuilt "Bluebird" has been pronounced ready for another try at the world's land speed record now held by Campbell himself.

The new racer has a slotted radiator that can be closed while traveling at top speed to lessen wind resistance. A fin-like projection deflects the winds smoothly from the rear end to prevent vacuum drag.

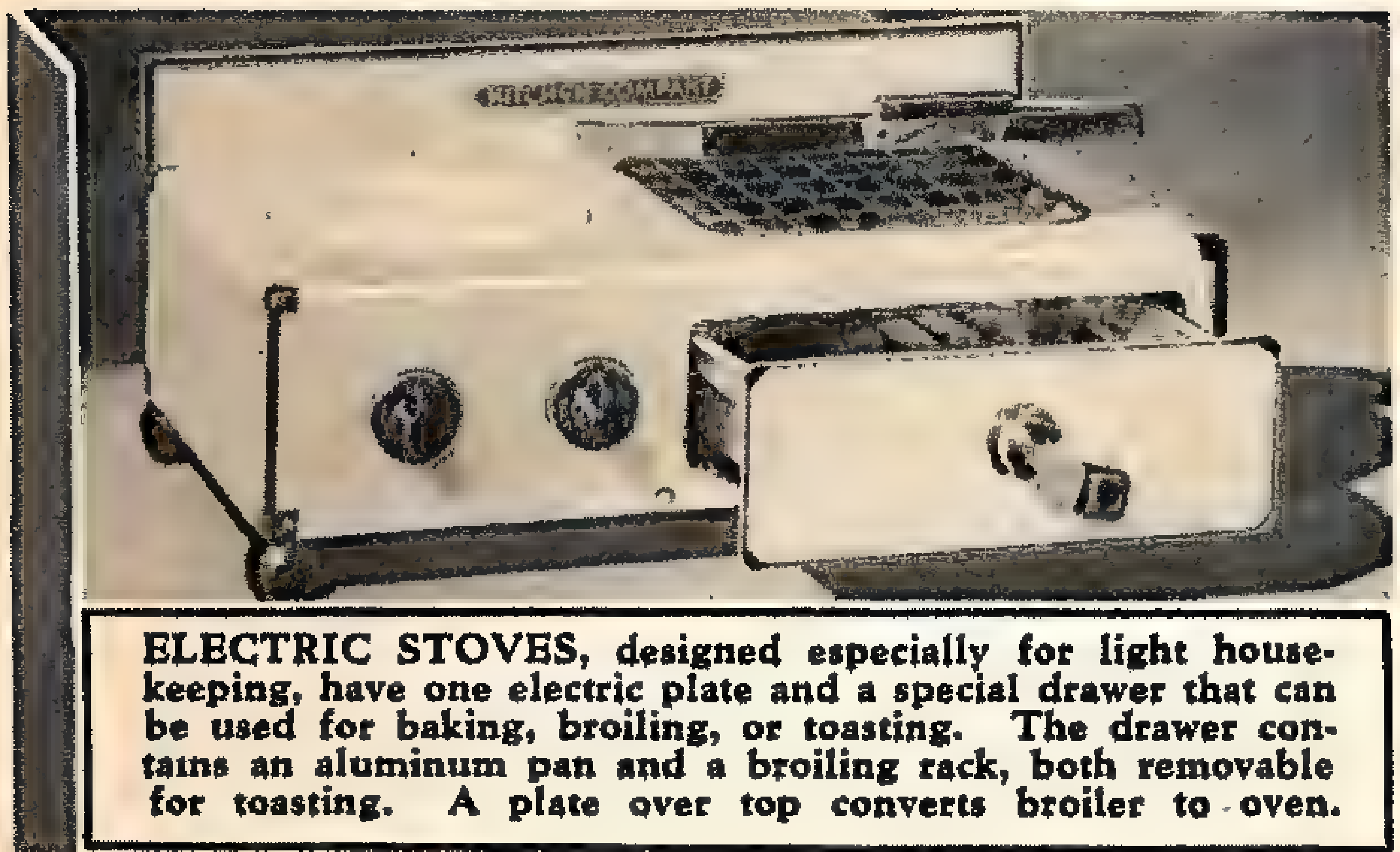
Clock Hands Show Valve Position

A VALVE position indicator with a clock face and hands can be read at a glance and tells exactly how many turns the valve is open. Like a stem set watch, the hands change position when the valve is turned.



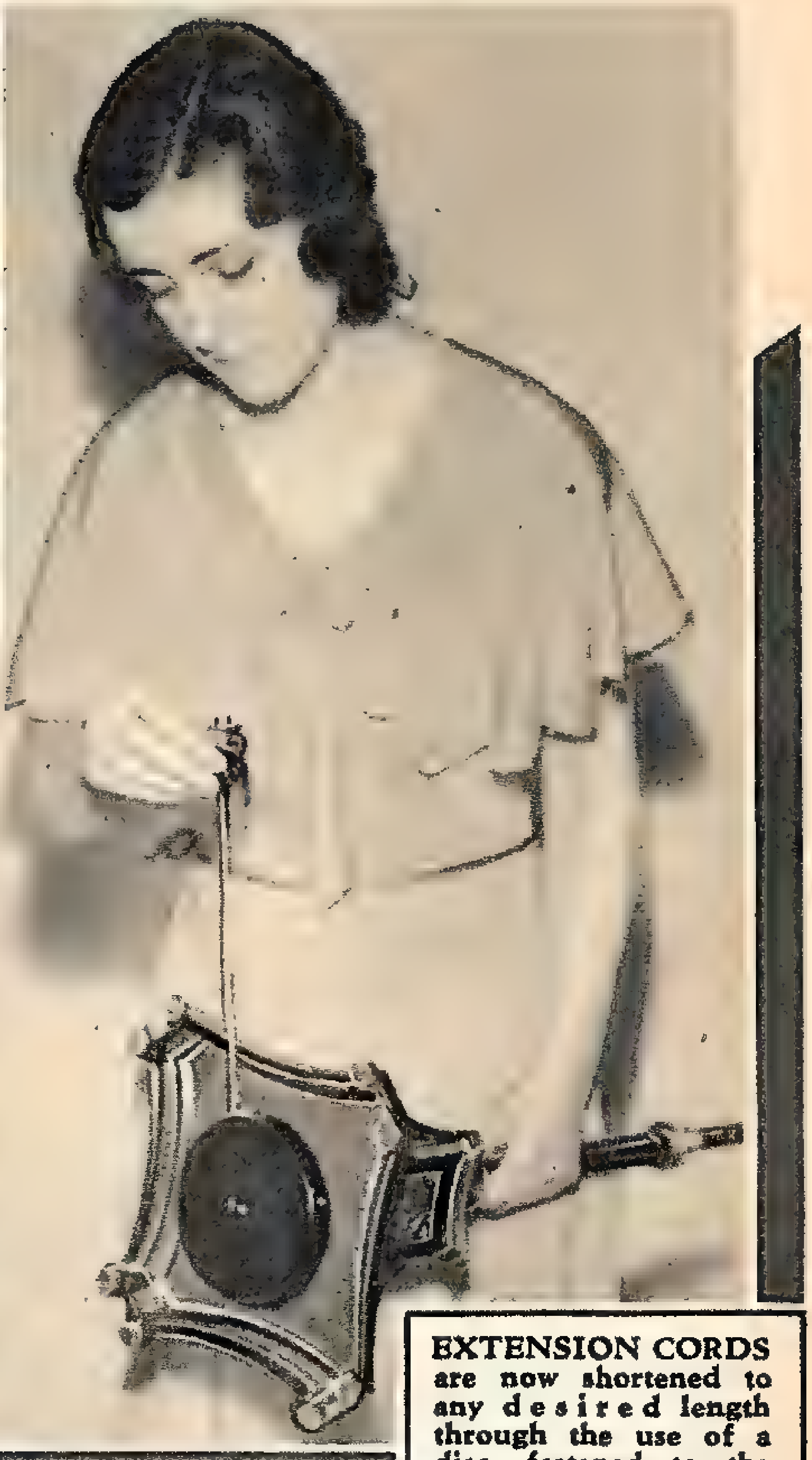
The hands on dial indicate the number of turns that the valve is opened.

Tiny Electric Plate and Handy Iron Lighten Labors of Busy Housewives

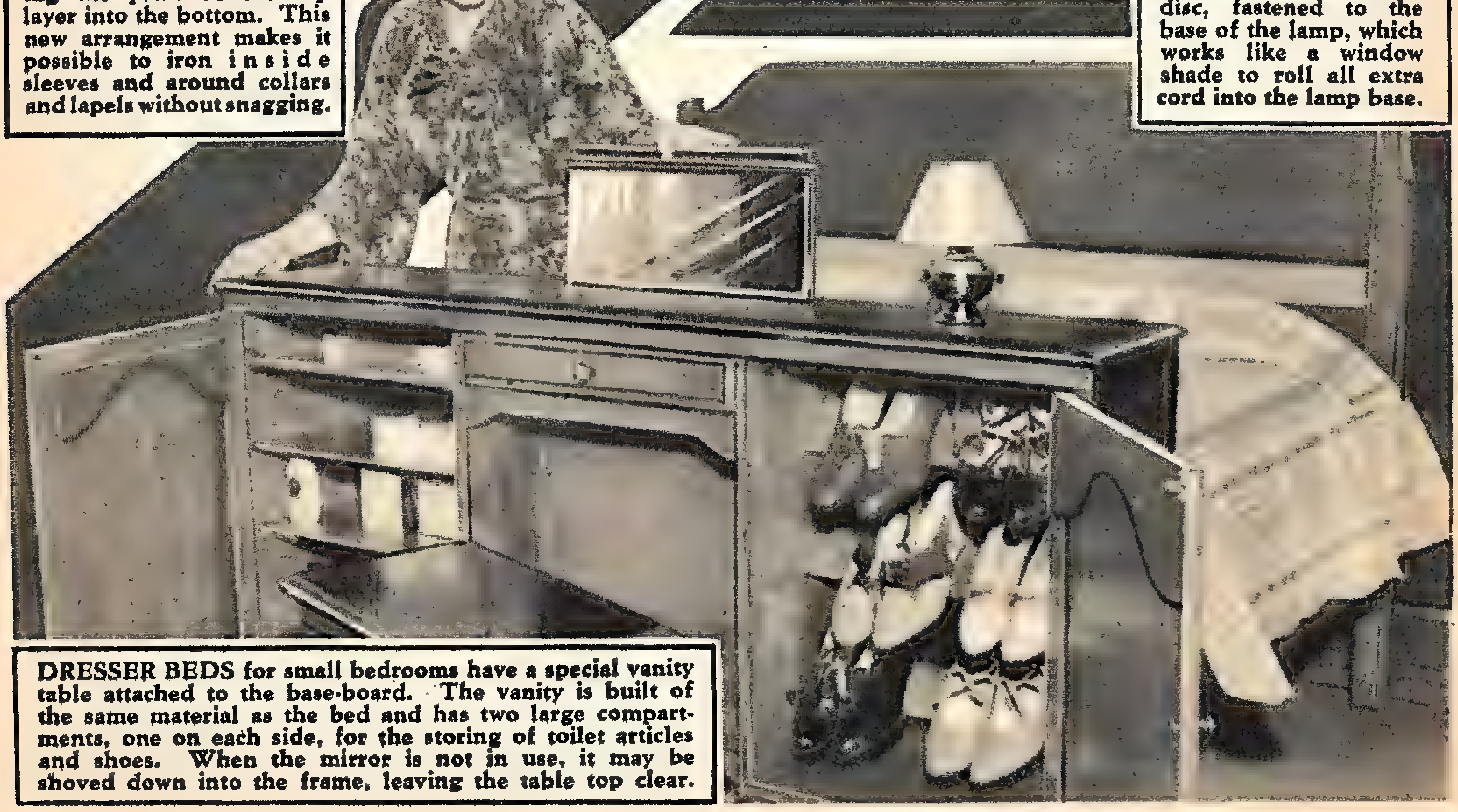


ELECTRIC STOVES, designed especially for light housekeeping, have one electric plate and a special drawer that can be used for baking, broiling, or toasting. The drawer contains an aluminum pan and a broiling rack, both removable for toasting. A plate over top converts broiler to oven.

ELECTRIC IRONS with the conventional front handle bracket eliminated now permit the ironing of a single cloth where hitherto the cloth had to be ironed in layers, impressing the print of the top layer into the bottom. This new arrangement makes it possible to iron inside sleeves and around collars and lapels without snagging.



EXTENSION CORDS are now shortened to any desired length through the use of a disc, fastened to the base of the lamp, which works like a window shade to roll all extra cord into the lamp base.



DRESSER BEDS for small bedrooms have a special vanity table attached to the base-board. The vanity is built of the same material as the bed and has two large compartments, one on each side, for the storing of toilet articles and shoes. When the mirror is not in use, it may be shoved down into the frame, leaving the table top clear.

ELECTRICAL CITY

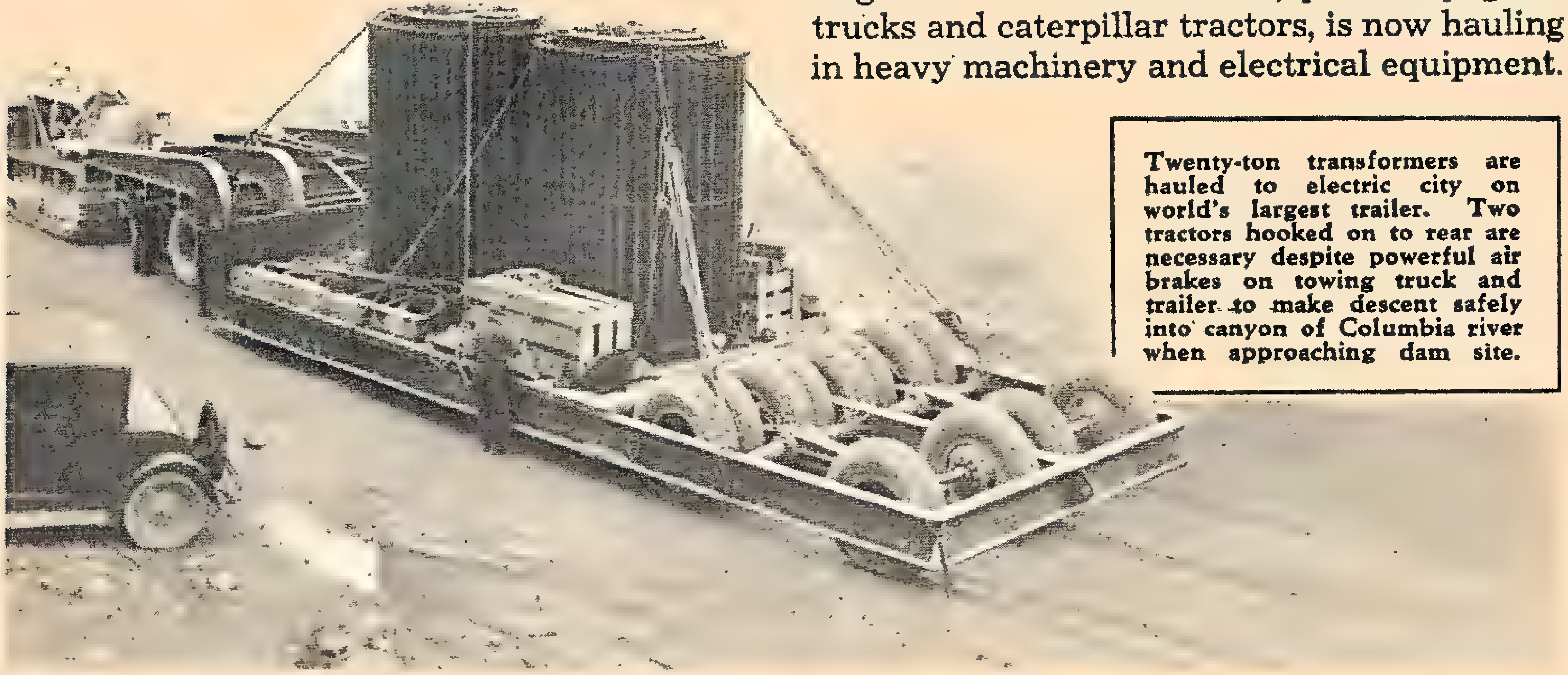
Nestling on sagebrush plateau high above swift-flowing Columbia river is Mason City—a town without a chimney—world's first all-electric city! Homes of U. S. engineers can be seen on near side of river. Grand Coulee Dam is being built at this point.

PRESTO! This was the exclamation of wonder when, not a generation ago, electric lights flashed on as tiny buttons were pushed. The invention of the electric washer, the electric range, the electric refrigerator, and the electric heater in turn brought forth this same exclamation.

But that an entire city should "Push the button" for all these purposes—that a town which is the home of nearly five thousand people should be built without a chimney is "presto" indeed; particularly when the city has been built within two months on a high sagebrush plateau in one of the wildest and least populated districts of the far west.

Such a miracle has happened. Mason City, constructed for the families, employees and officials of the contracting firm which is building the mammoth Grand Coulee Dam on the Columbia River, 92 miles west of Spokane in central Washington, is an all-electric city—the first in the world.

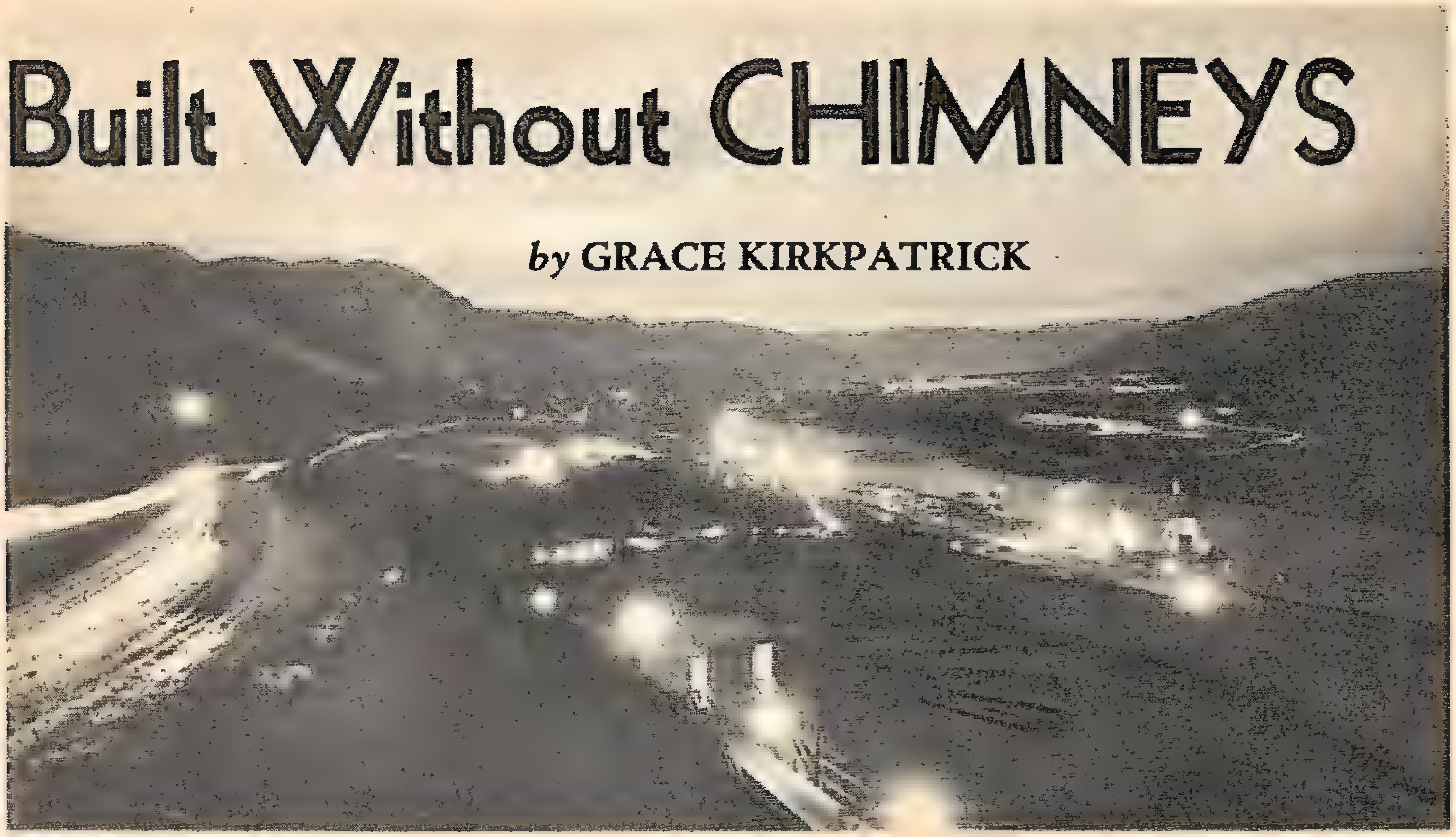
The inhabitants of Mason City will construct the world's greatest dam—almost four times as long as Boulder Dam, and with twice the power capacity of the gigantic Muscle Shoals project. In the development, the largest conveyor system in the world will carry spoil dirt from electric shovels even bigger than those used on the Panama Canal; the largest trailer in the world, pulled by giant trucks and caterpillar tractors, is now hauling in heavy machinery and electrical equipment.



Twenty-ton transformers are hauled to electric city on world's largest trailer. Two tractors hooked on to rear are necessary despite powerful air brakes on towing truck and trailer to make descent safely into canyon of Columbia river when approaching dam site.

Built Without CHIMNEYS

by GRACE KIRKPATRICK



Strikingly beautiful is this night view of world's first all-electric city—town built on east bank of Columbia river for construction workers on Grand Coulee dam project. Temporary wood bridge crossing river is expected to be destroyed by spring floods.

Every one of the 360 homes, as well as the business and office buildings, will be heated by electricity. Enough heating equipment is installed to keep buildings comfortable even at 29 degrees below zero, the lowest recorded temperature in the vicinity of the Grand Coulee in 22 years.

In addition to the heating units, each home has an electric range and electric refrigerator. Some of the larger homes will be equipped with complete air-conditioning plants.

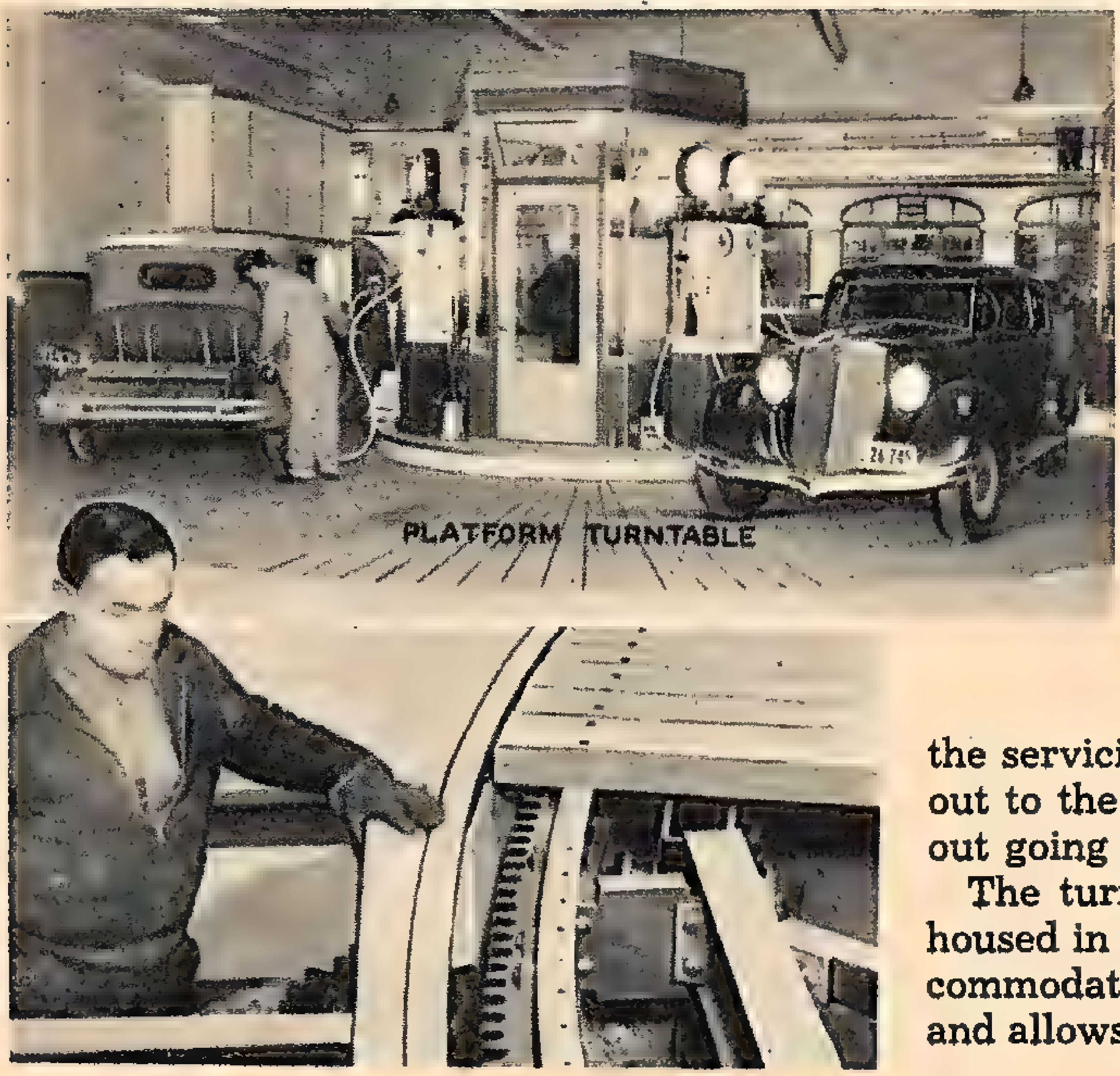
The heaters used are portable, the plans calling for 1½ to 6 kilowatt units in each of the rooms. Twenty-eight thousand heaters will be needed for the first 360 houses. The cost of installing and equipping a five-room house with these heaters will be approximately $160, as against about $250 for a

[*Continued on page* 129]

Left: Interior of one of five-room electric homes provided for workers building Grand Coulee Dam at Mason City, Washington. Portable electric heaters in 1½ to 6 kw. sizes, like that under windows, are used in each room.

Chimneyless homes like that shown at right were erected by crew of six men at rate of six a day, after lumber was cut to size and trimmed in Spokane mill.

Turntable Swings Autos To Pumps In Rotary Gas Station



Above—The booth and service pumps on the center island remain stationary; the autos are carried past on turntable. Below is shown an exposed section of the new turntable.

A NEW type of filling station that uses a turntable to whirl automobiles around a center service island was recently opened in New York.

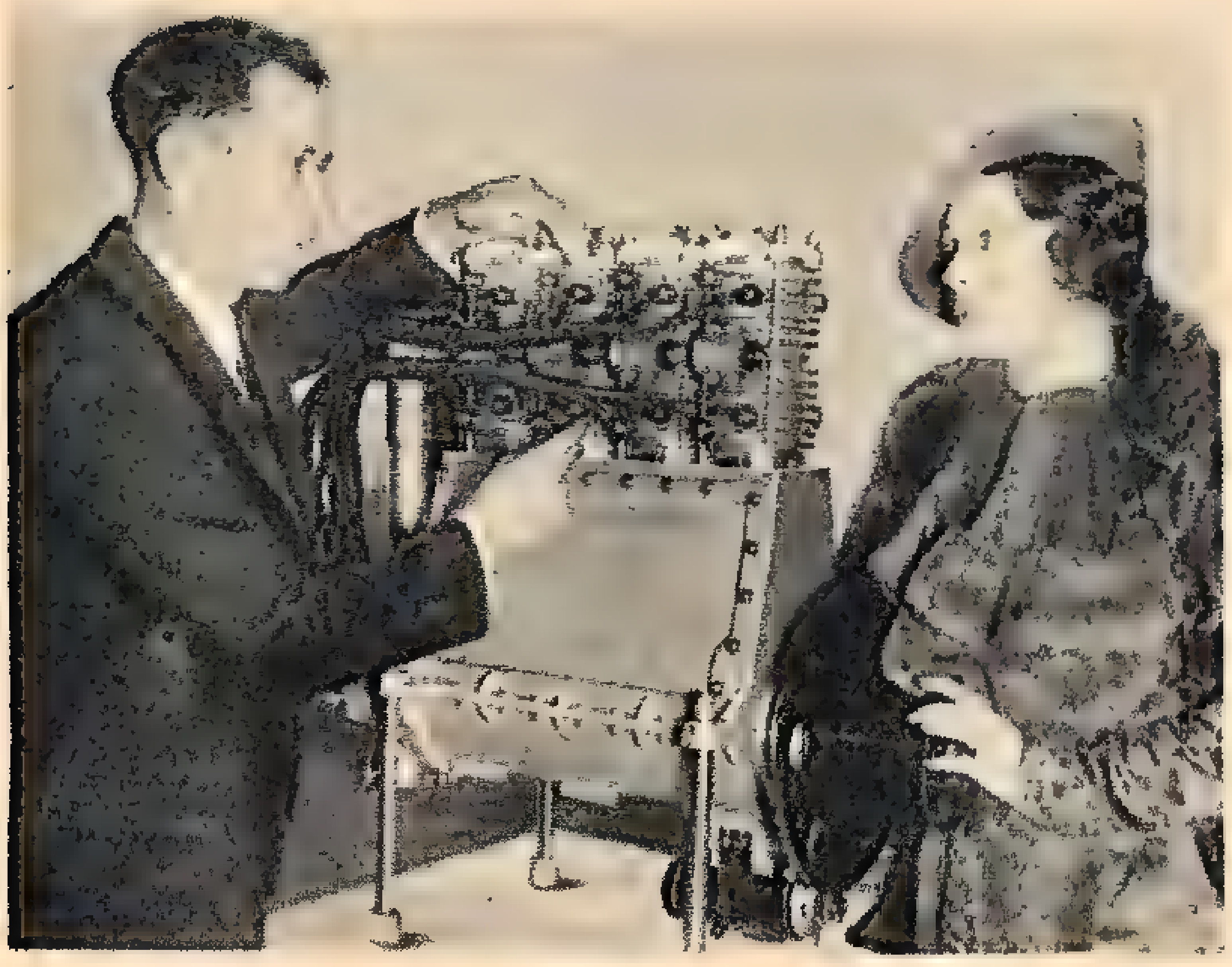
The service island is set in the center of the turntable and consists of an enclosed office with three separate pumping units to dispense gasoline, oil, air, and water. As the auto drives onto the platform, an attendant on the island presses a button which carries the auto into one of the three service positions. When the servicing is completed, the auto is swung out to the street and can be driven off without going into reverse to leave the station.

The turntable, 37 feet in diameter, can be housed in a building 41 feet wide. It will accommodate three automobiles simultaneously and allows a complete service in two minutes.

Build Light Diesel Plane Motor

AN EIGHT cylinder gas or Diesel airplane engine with 51 per cent less parts than the ordinary airplane motor was shown at the Hollywood National Inventors Congress by inventor F. A. Van Bezel of Los Angeles.

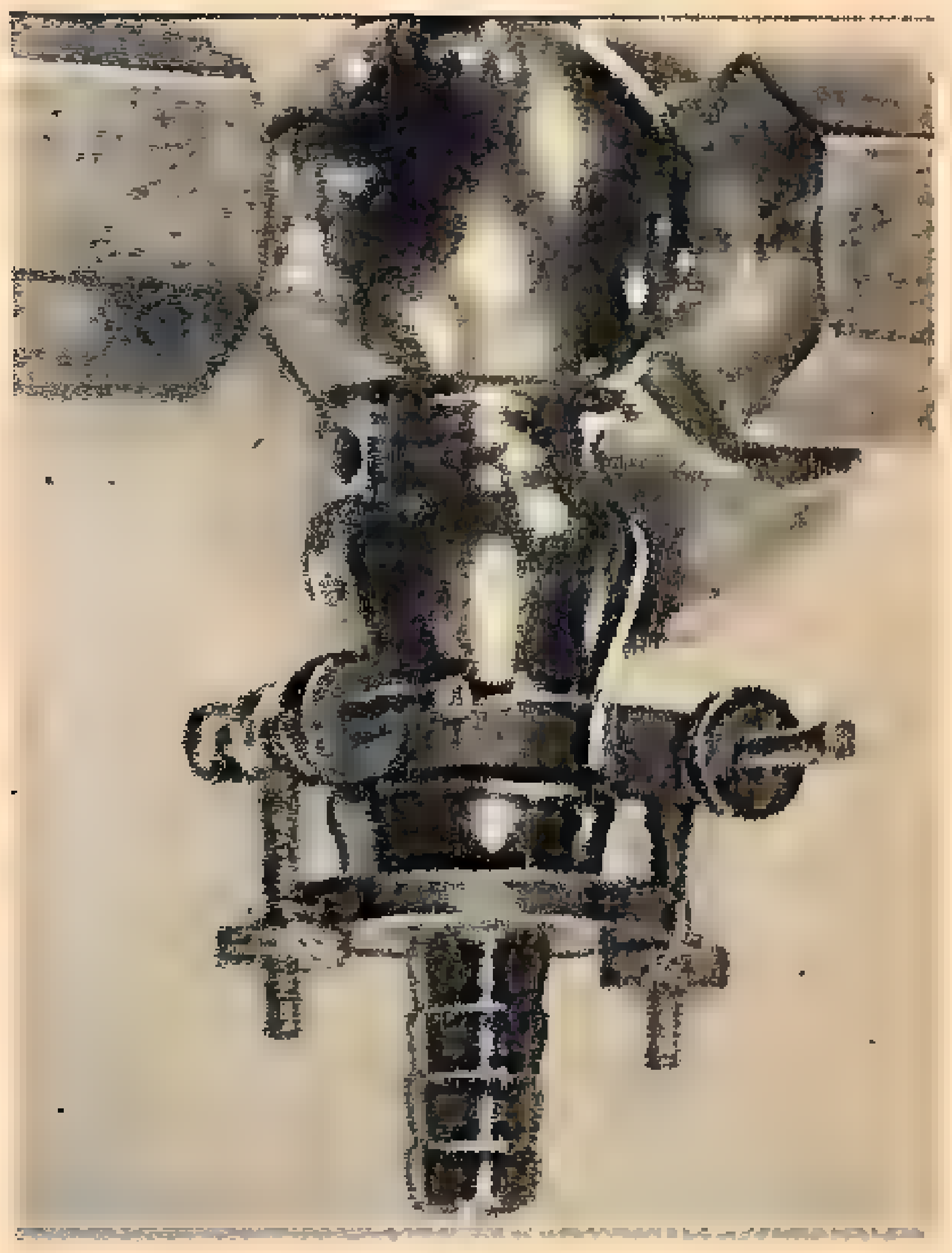
The motor is of the double acting, rotary sleeve valve type with a force feed directly to the valves. It weighs 151 pounds, is easily accessible for repairs, and develops 88.8 horsepower.



F. A. Van Bezel is shown demonstrating his new motor. It has 51 per cent less parts than the conventional airplane motor.

Shower Coupling Fits Any Faucet

A NEW coupling, designed for attaching portable shower hoses to a faucet has a stepped-off steel nipple which will hold all shower hose sizes. Adjustable braces permit horizontal and vertical tightening. A rubber washer at connecting point forms a close fit with faucet to prevent leakage.



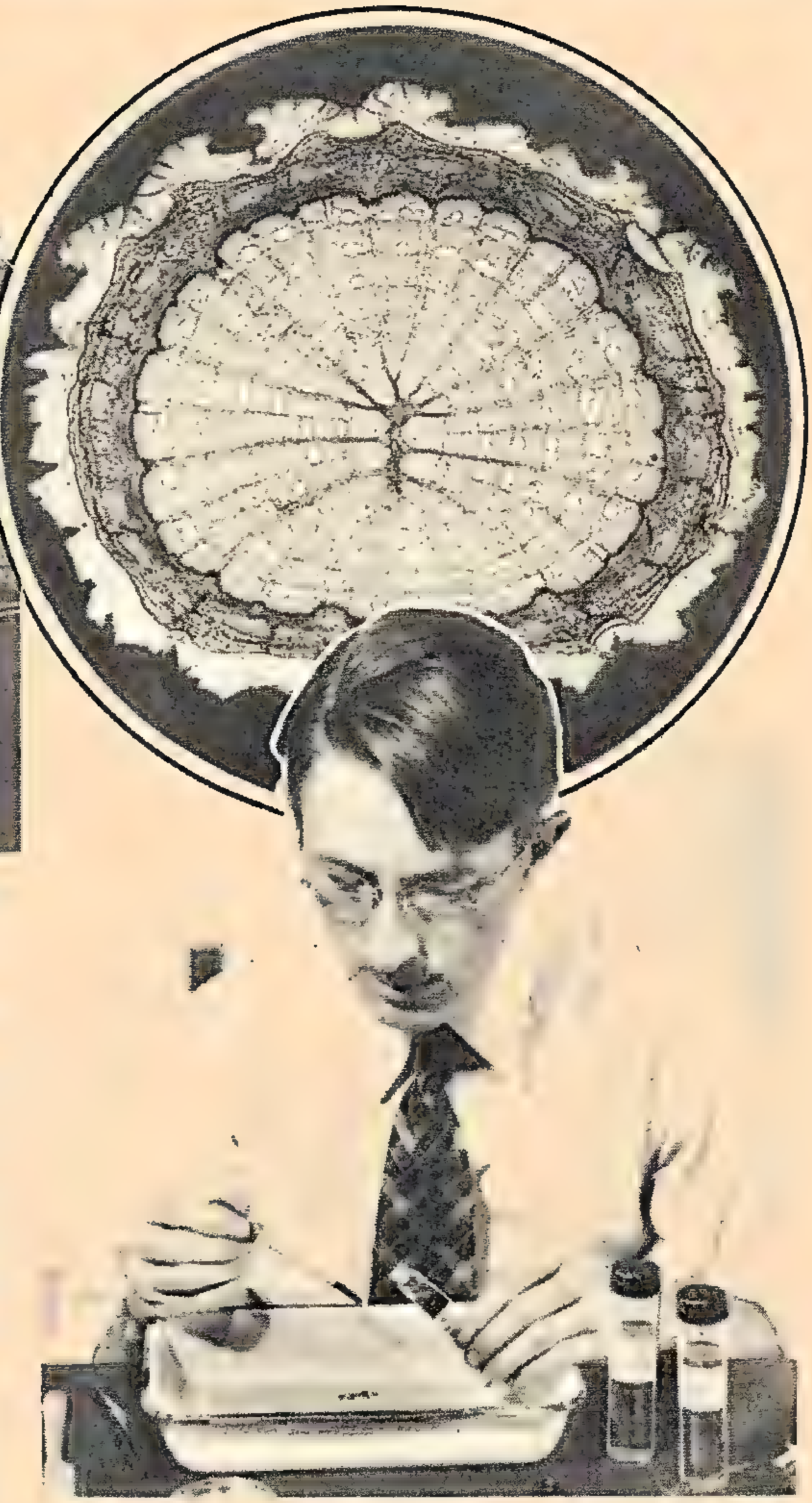
Coupling may be tightened two ways to fit any size of faucet.

Safe Explosive Resists Flame

A NEW explosive for blasting work in quarries and coal mines cannot be set off by strong commercial blasting caps, jarring, or fire. It is produced only in large diameters for extremely heavy types of work and can be exploded only by a large dynamite cartridge. Fumes from this explosive will not produce a headache. It is packed in air and waterproof packages.

How to Stain Your MICROSCOPE SLIDES

When staining slides in modern university laboratory, glass racks holding up to ten slides are transferred from one dyeing solution to another after proper period of immersion.



When staining individual slides, solution may be applied with dropper as pictured above. Cross-section of stem of Dutchman's Pipe, at upper right, is example of two-color staining. Without dyes no detailed structure would be visible.

by JULIAN D. CORRINGTON, Ph. D.

JACOB'S coat of many colors had nothing on the array of dyes used daily by the laboratory microscopist in making transparent objects visible under his instruments. Colors galore—reds, blues, and greens in scores of delicate shades—are to be found in the dye-filled vials covering his laboratory tables.

The microscopist uses color not for decorative purposes, but only to reveal the secrets of the tiny animal and plant cells which he studies. In many cases two or more colors are used on a slide to provide contrast. Here special dyes which react only to certain parts of the specimen are used.

For the amateur microscopist, one of the simplest experiments in staining can be done with a small piece of cotton fabric.

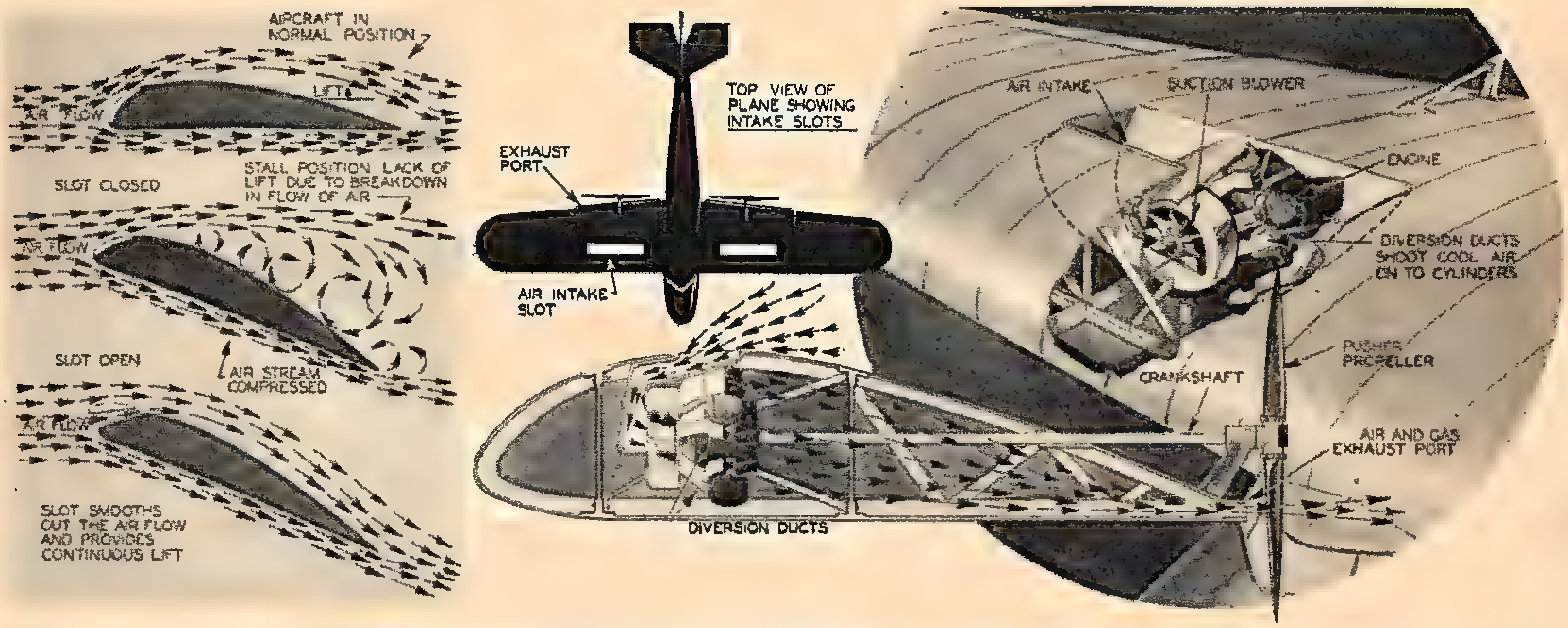
Prepare eosin stain by placing one gram of the dry powder in 100 cc of 95% alcohol and stirring until dissolved. If desired, this staining solution can be purchased ready made from scientific supply houses. Immerse the cotton in this solution for one hour. Remove the goods, rinse in fresh 95% alcohol, and mount on a blank slide for temporary examination under a microscope.

If you find the cotton insufficiently or unevenly stained, repeat the staining for another hour. If your final color is too dark, you can easily lighten it with acid destain, made up by adding one or two drops of pure hydrochloric acid to a vial of 95% alcohol.

Allow the cotton to remain in the destain only as long as the color comes away freely—further immersion will undo all the work of staining. Rinse in fresh 95% alcohol several times, adding a pinch of bicarbonate of soda to the first of these rinsing alcohols to

[*Continued on page* 132]

Stout Invents Top Wing Slot To Eliminate Plane Stalling


AIRCRAFT IN NORMAL POSITION
LIFT
AIR FLOW
SLOT CLOSED
STALL POSITION LACK OF LIFT DUE TO BREAKDOWN IN FLOW OF AIR
AIR FLOW
SLOT OPEN
AIR STREAM COMPRESSED
AIR FLOW
SLOT SMOOTHS OUT THE AIR FLOW AND PROVIDES CONTINUOUS LIFT
TOP VIEW OF PLANE SHOWING INTAKE SLOTS
EXHAUST PORT
AIR INTAKE SLOT
DIVERSION DUCTS
AIR INTAKE
SUCTION BLOWER
ENGINE
DIVERSION DUCTS SHOOT COOL AIR ON TO CYLINDERS
PUSHER PROPELLER
CRANKSHAFT
AIR AND GAS EXHAUST PORT

The three wings on the left show the air currents as they are deflected smoothly over wing top by front slotted wings. The Stout slots (right) are in the wing tops and suck in air to break "back eddies" and deflect it to cool the plane's motors.

AIRPLANE stalling due to "back eddies" on the top surface of a tilted plane wing is said to be eliminated by a wing slot recently patented by William B. Stout, noted inventor and designer of the first all-metal Ford tri-motor plane.

Hitherto, when the wing of a plane became tilted at a certain angle while traveling at a low rate of speed, these dangerous eddies broke the lifting force of normal air currents. The result was a loss of flying speed with the resultant danger of going into a stall and crashing. This danger was somewhat cut down by the wing-tip slot which was set in the leading edge of the wing to force a smooth flow of air over the wing top; Stout's wing-top slot is said to prevent stalling entirely.

With the new wing-top slot, the downward eddies will be broken and sucked in by a motor. Inside the wing, the air will be diverted to cool the motor. The ship's propellers at the trailing edge of the wing pull the air through an exhaust port, a small hole in the wing behind the motor.

PARAGRAPH ODDITIES OF SCIENCE

AN ORDINARY tree with fifty feet of foliage gives off about five barrels of water per day. The water is given off in the form of vapor and is absorbed by the air.—Ben Schuler, Ridgewood, New Jersey.

Tests on the vegetable prove that if a person is as "cool as a cucumber," he is exactly one degree cooler than the surrounding air.—Edward Merdinyan, Pawtucket, R. I.

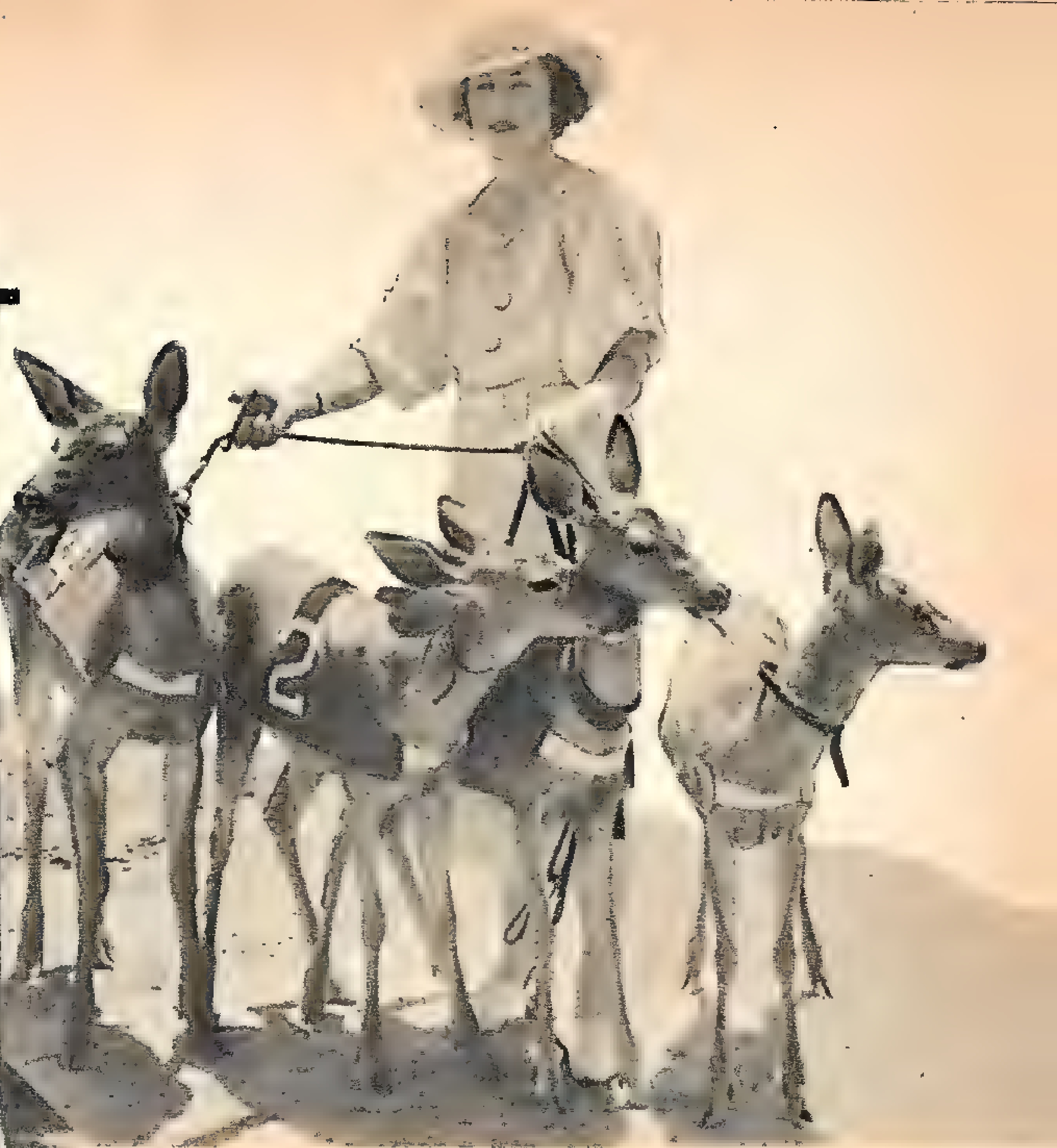
Germs have been discovered alive in the pyramids of Mexico. The germs are believed to be thousands of years old.—Melvin Cohen, New York.

The archer fish, an inhabitant of tropical waters, shoots his prey with a stream of water. Lying close to the surface, he shoots at flying insects, sometimes at a distance of four feet. The force of the stream knocks the insects to the water where they are eaten by the fish.—J. W. Lawrence, Vancouver.

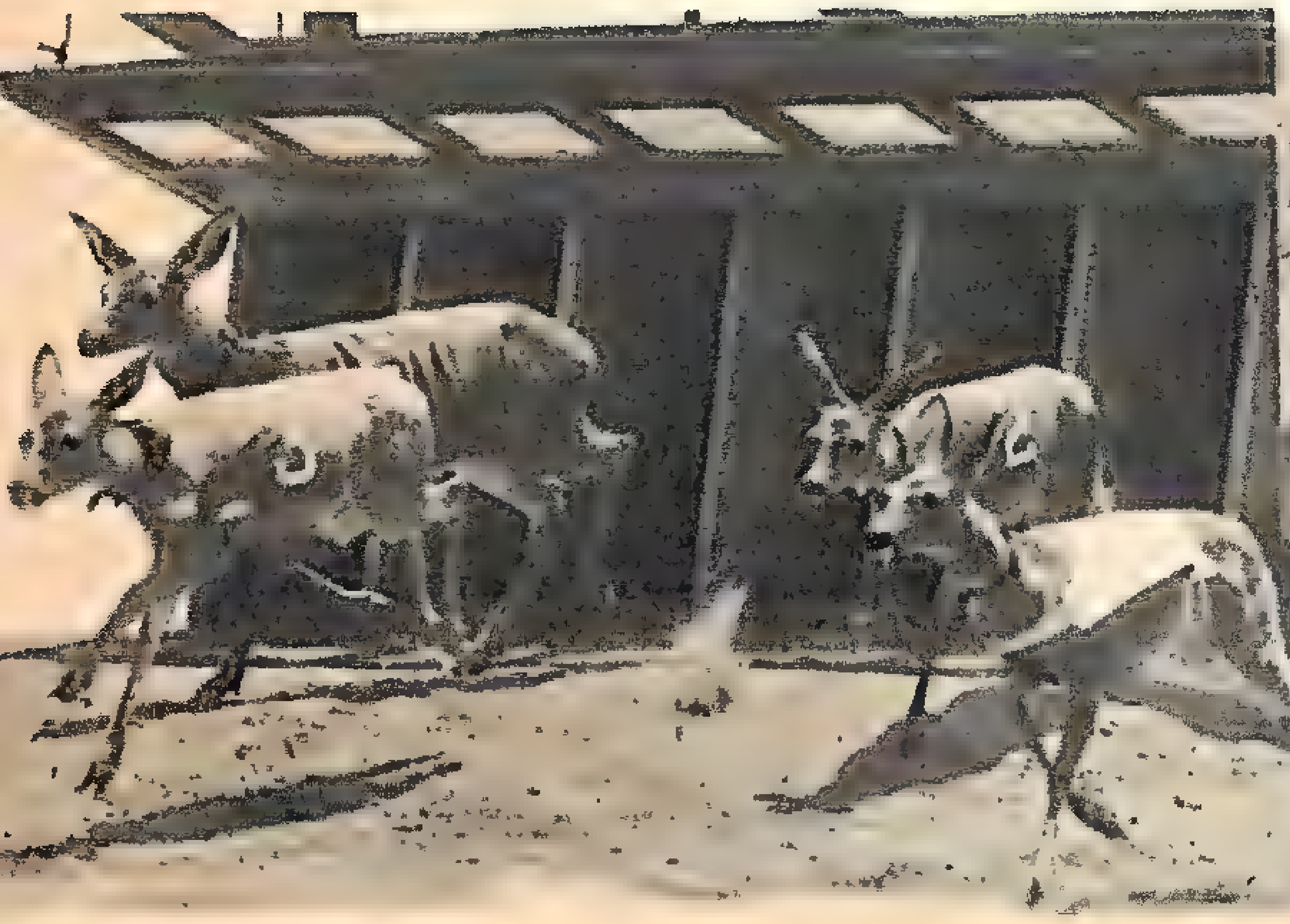
Diamonds will burn if heated red-hot and plunged into pure oxygen gas. Diamonds, like coal, are formed from carbon. They are compactly crystalized and do not burn easily. There is not enough oxygen in ordinary air to cause combustion.—Robert Armstrong, Stockton, Calif.

RACING DEER NEWEST SPORT

by F. LELAND ELAM



Above—Mrs. Wilbur Timm and five young deer that were trained for racing.



Breaking away from the starting boxes, the deer dash away like greyhounds. A police whistle is used to start them out.

FLEETFOOTED deer are being trained for the hurdles and obstacles of the steeplechase course in California's newest racing sport. They have been taught to circle a race track and leap hurdles with greater ease and grace than the best horses.

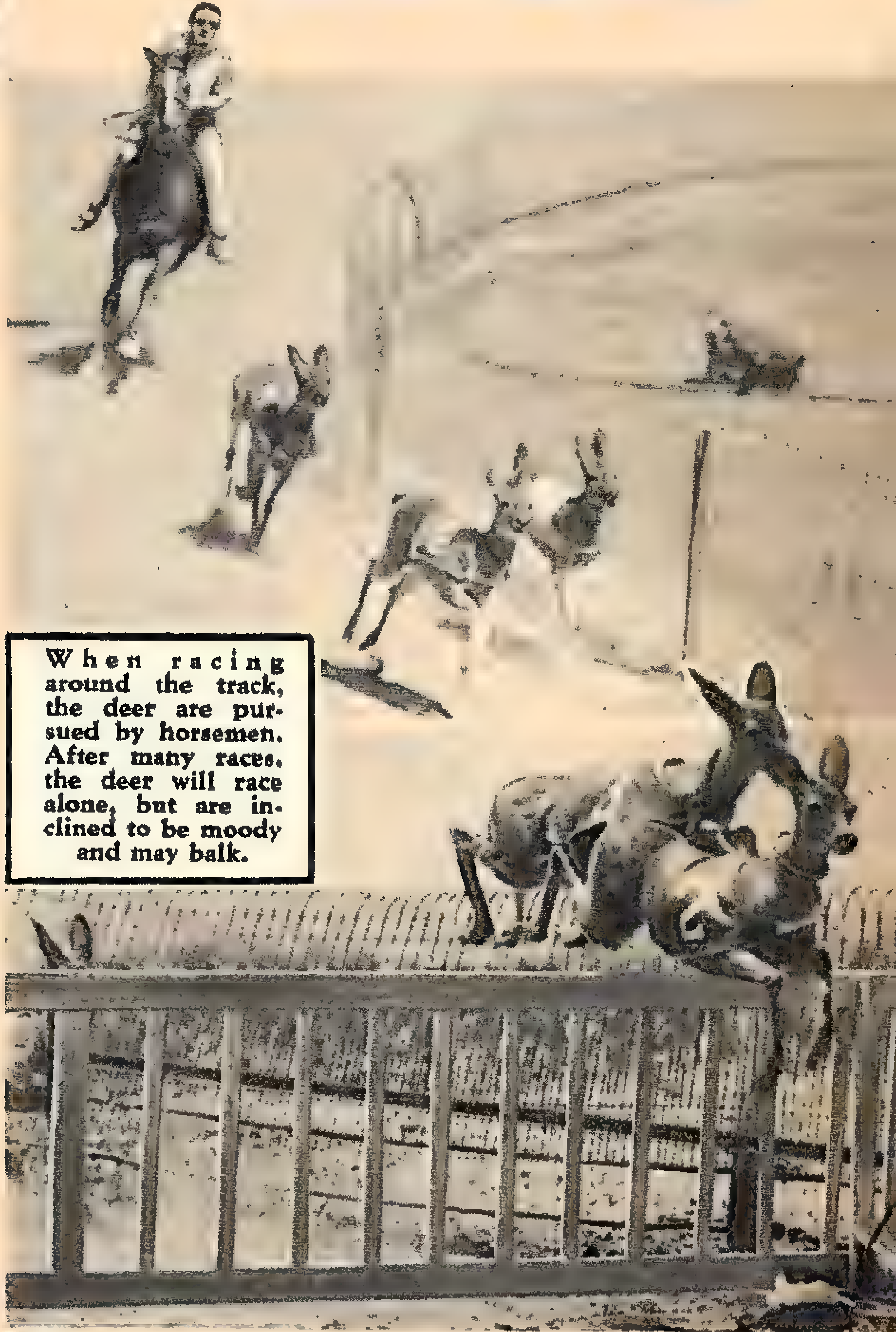
Mr. and Mrs. Wilbur Timm, of Kelsey, Calif., started the new sport. More than a year ago they caught five young deer in Oregon. When the animals were three months old, the first step in training began. Each deer was taught to wear a collar with a leash.

The leash was attached to a wire fastened between two trees to permit the deer to run back and forth. Because of the danger of the animal injuring itself in its efforts to get free, the trainer was with it night and day.

When the deer became accustomed to the collar and leash, he was taught to lead. For two days the animal was led about without stopping. Worn out, the animal finally gave in and followed the trainer willingly.

The hurdles were next, the deer following the trainer over each hurdle. Because a deer will not run fast unless pursued, a horse and rider urged him to racing speed.

After many races the deer got the idea of racing and vied for the lead. The horse, however, always follows them.



When racing around the track, the deer are pursued by horsemen. After many races, the deer will race alone, but are inclined to be moody and may balk.

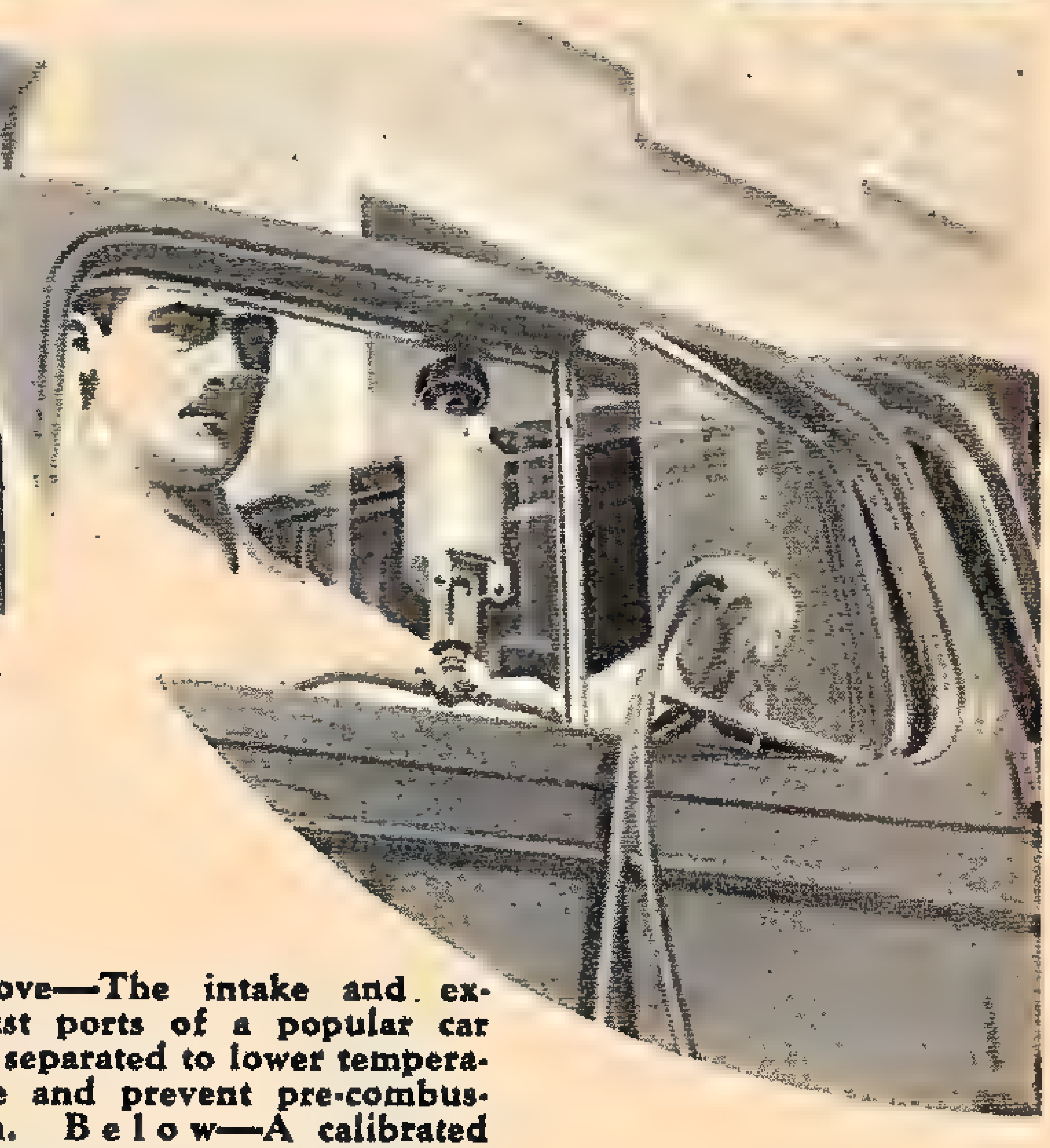
Going over the hurdles, deer are swifter and more graceful than steeplechase horses. Trained deer enjoy racing.

CLIPPING DOLLARS FROM

TABLE SHOWING COMPRESSION RATIOS OF WELL-KNOWN CARS FOR MODELS OF 1931-34

	1934	1933	1932	1931
AUBURN 6-52	6.20	5.26	5.28	
BUICK 34-60	5.25	5.25	5.09	4.75
CADILLAC V-12	6.25	5.60	5.30	
CHEVROLET MSTR 6	5.45	5.20	5.20	5.02
CHRYSLER 8	5.20	5.20	5.20	
DODGE 6	6.20	5.50	5.33	5.20
DE SOTO	6.20	5.33	5.33	
FORD V-8	6.33	6.33	5.51	4.22
GRAHAM STD. 6	6.50	6.50	6.50	
HUDSON 8	5.80	5.80	5.80	
HUPMOBILE	5.75	5.75	5.40	
NASH 8	5.25	5.10	5.10	5.00
OLDSMOBILE 8	5.70	5.50	5.90	
PACKARD 8	6.00	6.00	6.00	
PLYMOUTH	5.80	5.50	4.90	4.60
PONTIAC 8	6.20	5.70	5.20	4.90
STUDEBAKER 8	6.30	5.50	5.20	5.2
AVERAGE	6.10	5.59	5.50	4.96

Experimental engineers are shown checking gas mileage after a test run. Each can holds an exact measure of various testing fuels.



Above—The intake and exhaust ports of a popular car are separated to lower temperature and prevent pre-combustion. Below—A calibrated measure full of fuel is attached to window to test gas mileage.

A SQUAD of marathon drivers recently piloted cars of all makes over western highways in a series of gruelling road tests. Attaching to each a special gasoline tank containing an elaborate series of measured compartments, and using precision odometers recording distance down to 1-1000th of a mile, they put their automobiles through weird and racking ordeals. They ran them up-hill at a snail's pace, raced them into the wind, climbed to 10,000-foot mountain peaks, made rocket-like getaways, and squealed to sensational stops in clouds of burning rubber smoke. They tried every gas and oil known to man in various combinations, using high precision instruments to record the results. Then, from notebook, table, and chart, they read figures which revealed secrets of stingy driving by which a driver can actually cut his gasoline bills as much as fifty per cent.

Do you know your engine's compression ratio? Probably not three drivers in a hundred do, yet this information is important in choosing the right fuel for economy and power.

Do you know what octane number is best to use?

Are you on speaking terms with SAE numbers in grading oils?

These things are more than obscure engineer's jargon; they mean a chance to fit your car with gasoline tailored to meet its needs,

AUTO RUNNING EXPENSES

by

MAXWELL REID GRANT

Above left—Adjusting a carburetor for leanness and idling speed helps keep the motor in tune. Below—The "octane selector" adjusts the motor to handle the fuel that is being used.

Above—Charles F. Becker is shown at the controls of the elaborate equipment used to test gas consumption under varying conditions. Left—Adjusting the heat control on a popular car prevents waste from imperfect fuel combustion.

and to save many dollars in fuel, oil, and repairs.

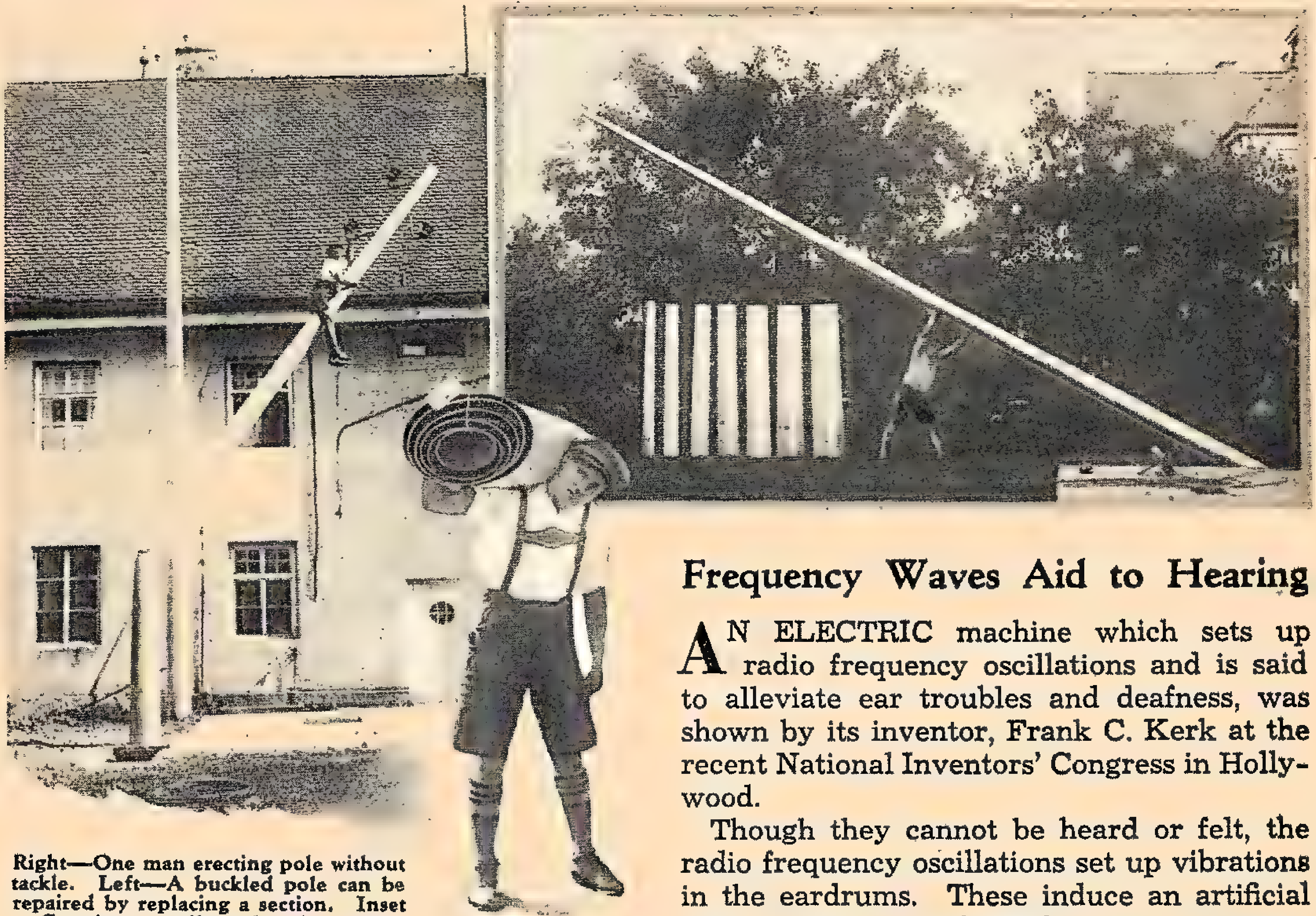
The way you drive probably has more to do with your gasoline bill than any other factor. Records prove that modern cars can be run economically. Last year the dealers for a popular make of car staged a "Scotch driver" contest, in which the public was invited to see how far they could drive on a pint of gasoline. The fuel was put into an accurate glass measuring tube, attached to the window beside the driver, so that he could see for himself how much he was using. Rubber tubing connected the device to the fuel line. All contestants drove over the same route, which was fairly level but took them through some city traffic.

When the scores were turned in, many people refused to believe them, for the winners drove as far as 50 miles to the gallon! There was no trick, however. "Scotch" driving, plus a carefully tuned motor, was the secret.

Automobile men are chuckling over a story that is still going the rounds. Dealers for a light car no longer manufactured, set out to

[*Continued on page* 123]

Collapsible Steel Phone Poles Can Be Erected By One Man



Right—One man erecting pole without tackle. Left—A buckled pole can be repaired by replacing a section. Inset—Carrying a collapsed pole section.

A NOVEL type of telegraph and transmission pole that can be carried in sections and erected by one man without the aid of tackle and hoisting gear has been put into service in London, England.

The poles consist of two sections. Each section contains 12 tubular units that fit one into another and which can be extended to a length of about 30 feet. The sections are fitted together before raising and tightened to a close fit by a hand-operated gear.

The cross-section arms that hold the insulators are welded into a ring that is slipped or clipped solidly onto one of the uppermost sections of the pole.

Marconi Predicts Talks to Mars

INTER-PLANETARY radio communication between the earth and Mars is not at all impossible, according to a statement by the Marquis Guglielmo Marconi, inventor of the wireless telegraph. "It is simply a case of improving present-day instruments sufficiently," he said. Noting the rapid forward progress of radio, he claims that since there is no limit to distance, there can be no limit to radio development.

Frequency Waves Aid to Hearing

AN ELECTRIC machine which sets up radio frequency oscillations and is said to alleviate ear troubles and deafness, was shown by its inventor, Frank C. Kerk at the recent National Inventors' Congress in Hollywood.

Though they cannot be heard or felt, the radio frequency oscillations set up vibrations in the eardrums. These induce an artificial fever, which, it is claimed, create a curative flow of blood into the affected tissues.

Above picture shows the new machine which is said to alleviate the effects of deafness by radio frequency waves.

Revolving Mast Solves Tacking; Sets Sail Automatically

A NEW type rigging for sail boats which automatically sets the sail on a change of wind, was recently invented by Fredrik Ljungstrom, Swedish engineer. It is said to simplify sailing to the point where one man can easily handle any of the smaller sized boats.

The new rigging is a revolutionary development consisting of only one double-folded sail fastened to the front of the mast from top to bottom. The mast, itself, is set farther forward than is customary and revolves on ball bearings to keep the sail billowing before favorable winds.

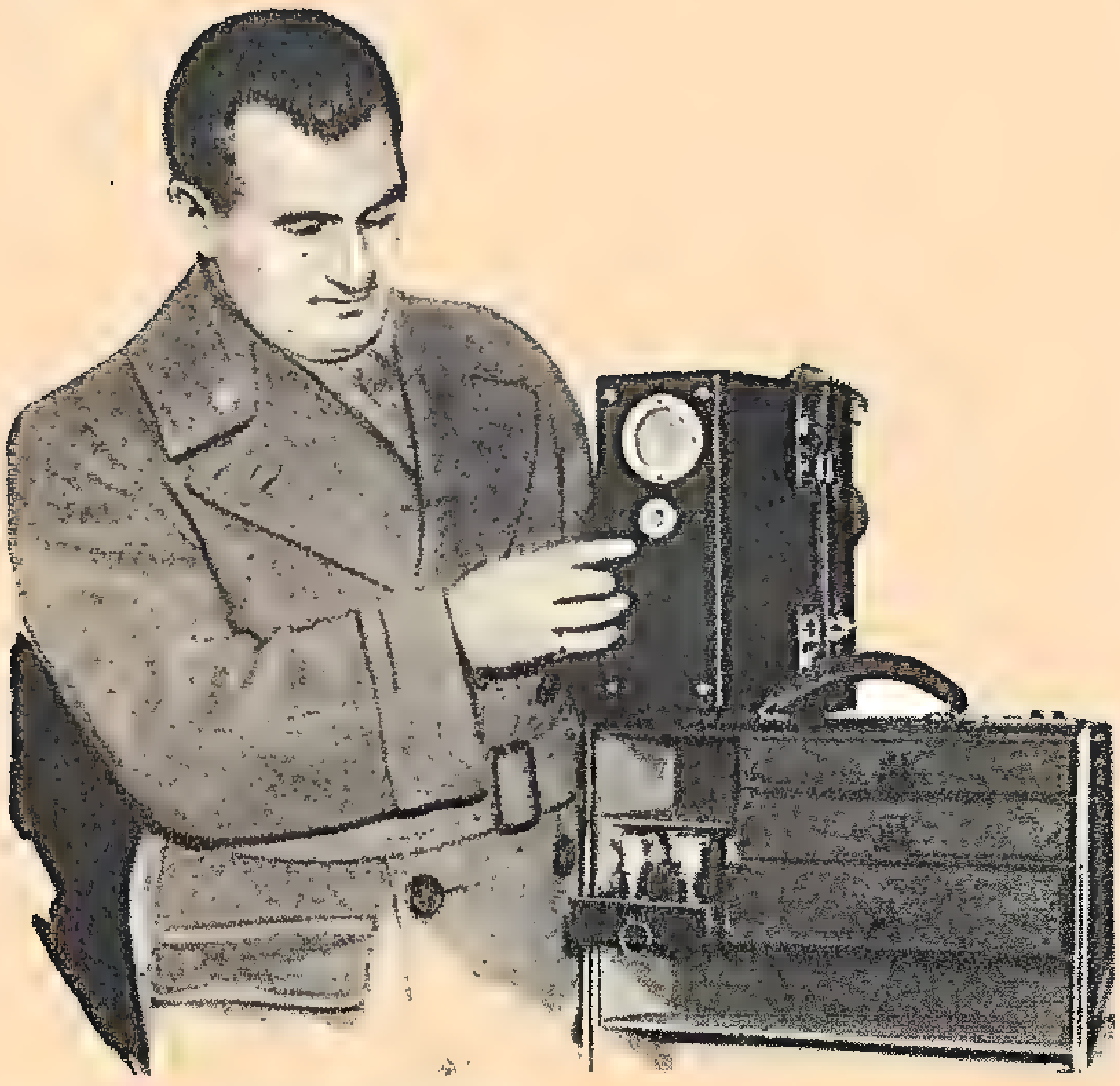
An endless rope is fastened to the sail tips and passed through a pulley on the stern deck, automatically shortening and lengthening to keep the sail taut as the mast turns. The sail winds around the mast for storage.

Traveling Bag Yells At Thieves

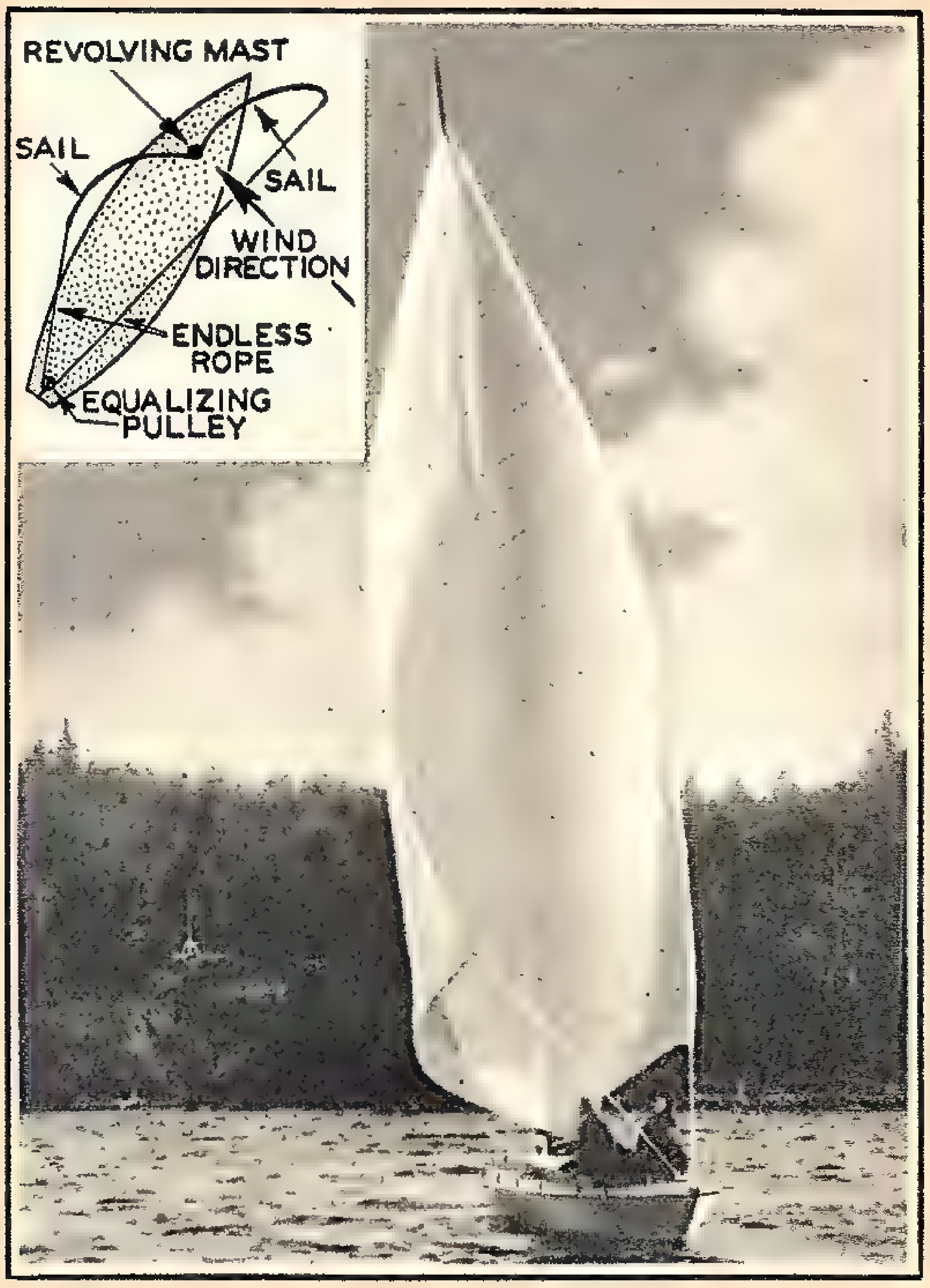
A TALKING bag that emits loud, strident warning shrieks when touched by a person other than its owner, was designed by H. Adler to thwart the silent skill of burglars and baggage snatchers.

The talking unit can easily be placed in any type of traveling bag and wired to a concealed switch known only to the owner.

Such a bag can be left unattended in shops or stations and has already attracted the attention of bond men and jewelers who must often carry valuables through crowded streets.



The inventor, H. Adler, with his talking bag unit designed to emit a warning cry when lifted by an unauthorized person.



Fredrik Ljungstrom and two friends in a boat equipped with the new rigging. Upper left—Top view of rigging construction showing how it revolves to catch the wind.

Venom Cures Bleeding Patients

THE venom of one of the world's most deadly snakes, the Vipera russelli of Southern Asia, has a curative effect when applied to bleeding cases. So powerful is this poison as a blood clotting agent that it can stop severe cases of the "bleeding disease."

Combine Radio Phone and Mike

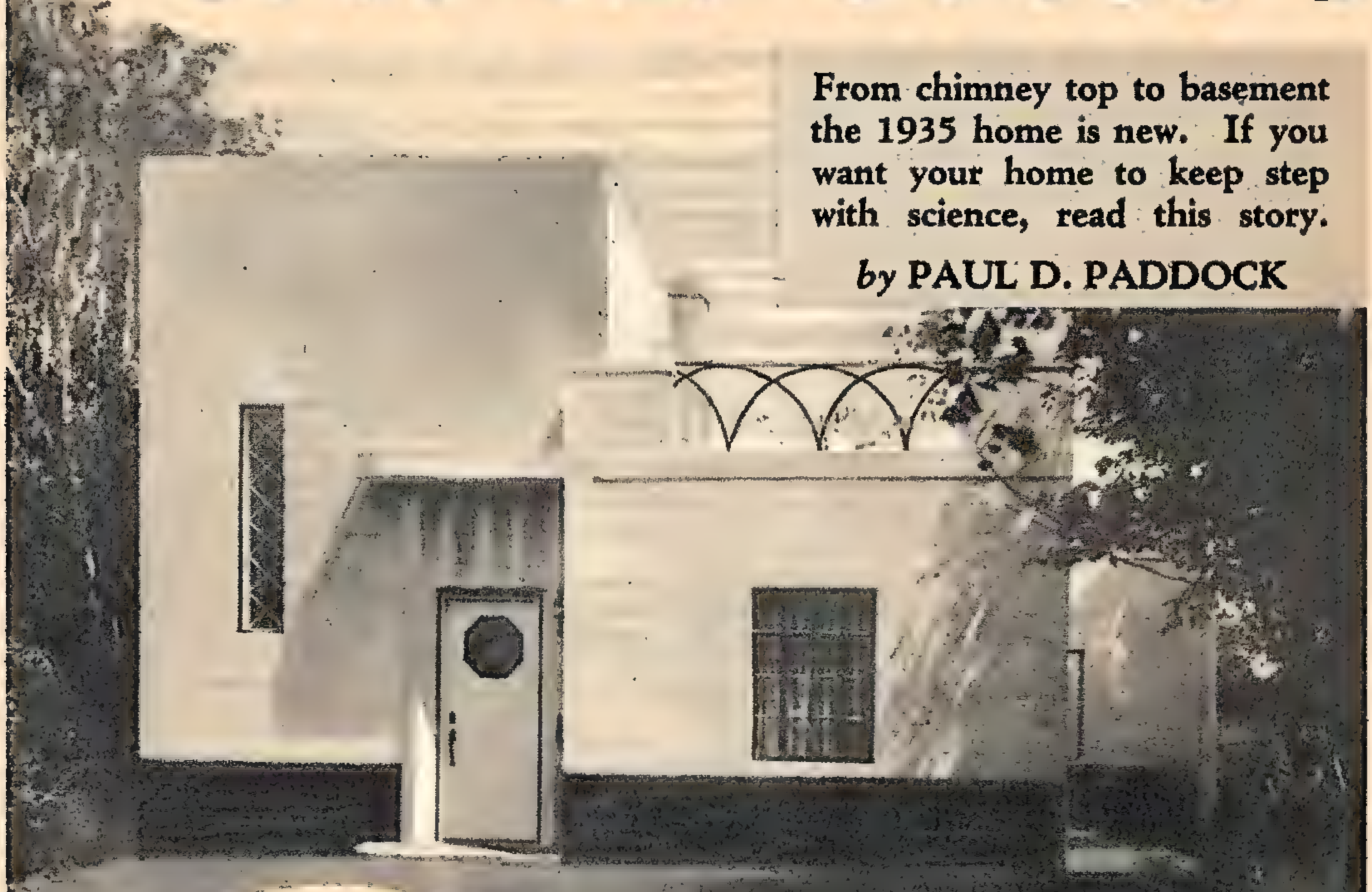
A NEW handset for portable radios combines a microphone transmitter with a telephone receiver to resemble the conventional "French" telephone. The handset is chiefly designed for use in police squad cars having two-way radios.

The new hand set combines a microphone transmitter with a sensitive telephone receiver.

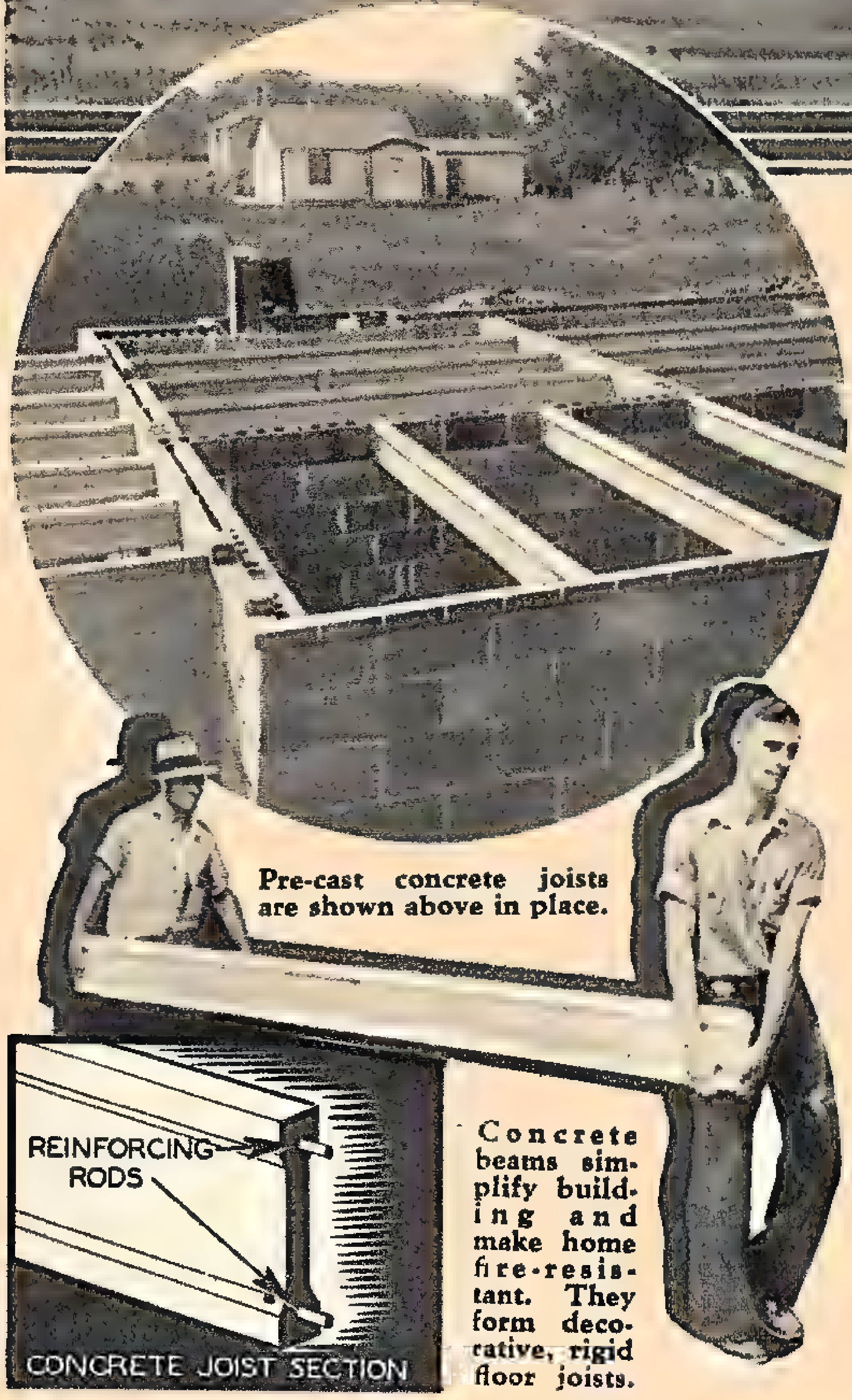
SCIENCE BUILDS

From chimney top to basement the 1935 home is new. If you want your home to keep step with science, read this story.

by PAUL D. PADDOCK



This modern, entirely fireproof home was built for $2,700. It is 100 per cent concrete. Cement paint covers the walls.



Pre-cast concrete joists are shown above in place.

Concrete beams simplify building and make home fire-resistant. They form decorative, rigid floor joists.

FOUNDATIONS are rising, hammers are swinging and new roofs are gleaming in the sun! America is building new houses!

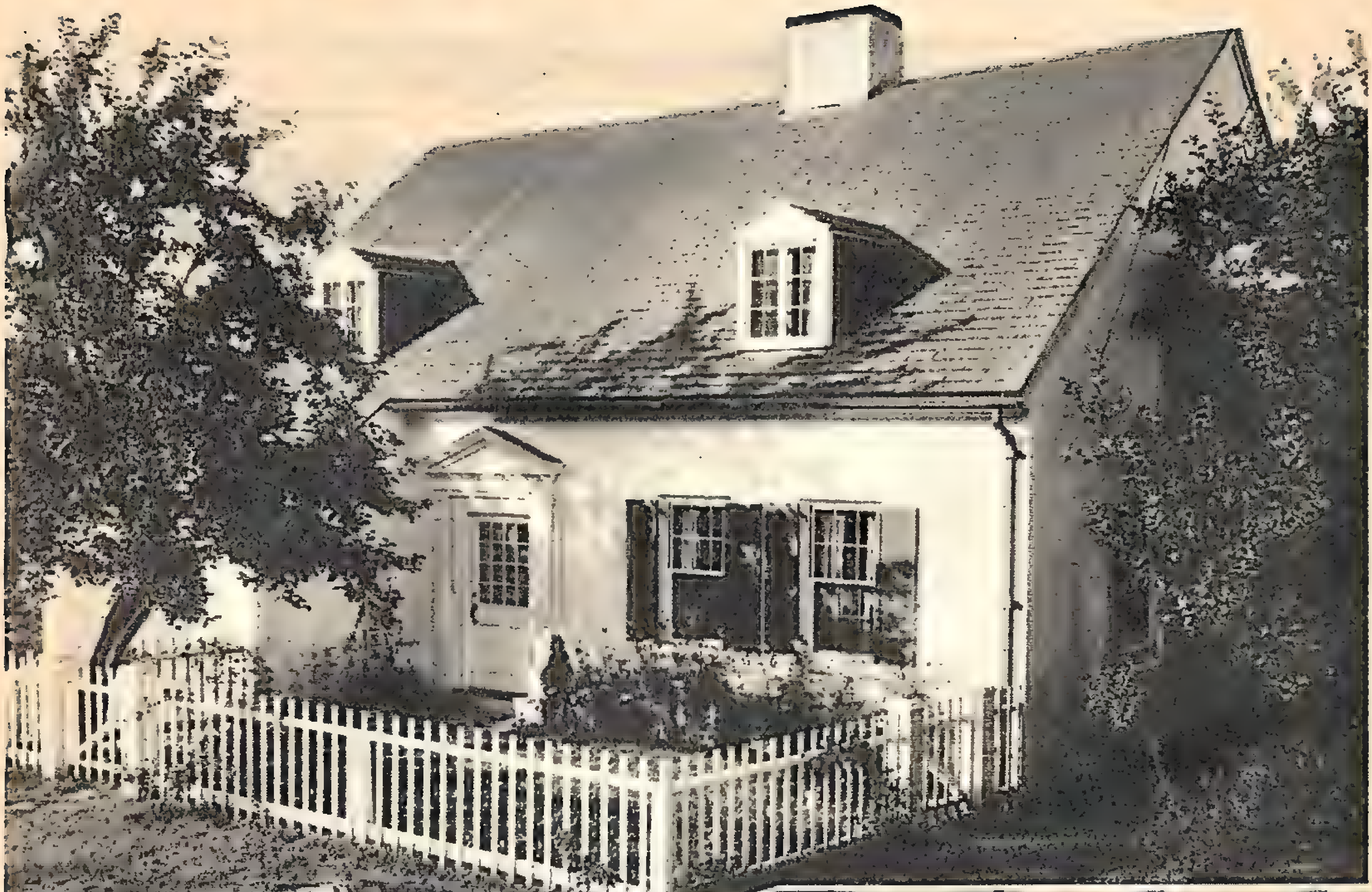
In 1933 and 1934, we built less than 80,000 family homes, a pitiful total for a nation of 30,000,000 growing families. Conservative authorities declare that we have a shortage of more than 600,000 homes. This year will see 100,000 new houses built, possibly more, as the gigantic task of home-building gets under way.

The 1935 model is not just another house. From chimney top to basement it's new. More than 300 materials, structural, decorative and otherwise, new to what commonly was in usage six years ago, are now on the market. Scores of others are in the laboratory stage.

Science has turned house-builder. It offers the builder a product that, in some respects, is as far in advance over the old-fashioned house as today's automobile is ahead of the earliest models.

The house that science already has built and is building today cuts fuel bills. Reductions

the MODERN HOME



This Cape Cod cottage with latest home improvements was built for $6,000. Walls are of concrete, painted white.

of fifteen to thirty per cent are common matters of record. The new house cuts the cost of summer cooling and promotes the efficiency of air-conditioning apparatus the year around.

It saves steps. Where a woman walks four miles a day doing her work in an old-fashioned house, she walks three or less in a modern house of equivalent service.

The house science is building is far easier to keep clean and far more healthful. It is justifying lower insurance rates and other maintenance costs. It is more successfully built to withstand storms of all sorts, fires, and insect ravages. It is styled for the times and for the people in step with the times.

Common sense is replacing convention.

The above statements are not claims. They are facts. Houses already up and occupied prove every assertion just made. This article does not relate to the "fad" house or the "freak" house. The new house that science is building is as natural as the automobile and fully as necessary.

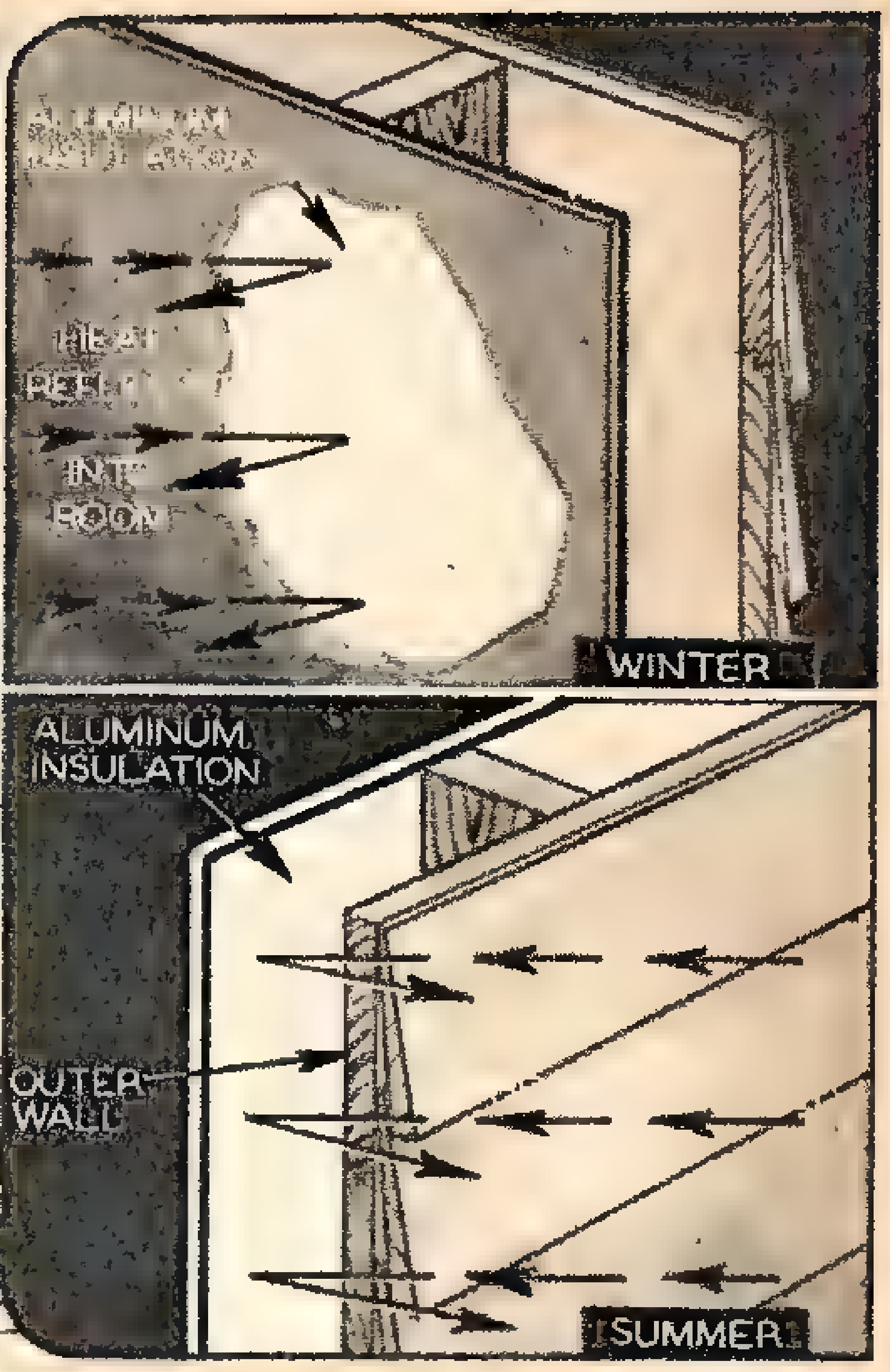
Blankets for the house roof and walls, such as the above, are made from limestone, slag, glass and other materials to reduce heat losses and keep out summer temperatures.

Economy, greater simplicity, smart new style, interesting use of color—these and other generalities apply to the new house, but take a look at some of the specific products that go into this new American abode.

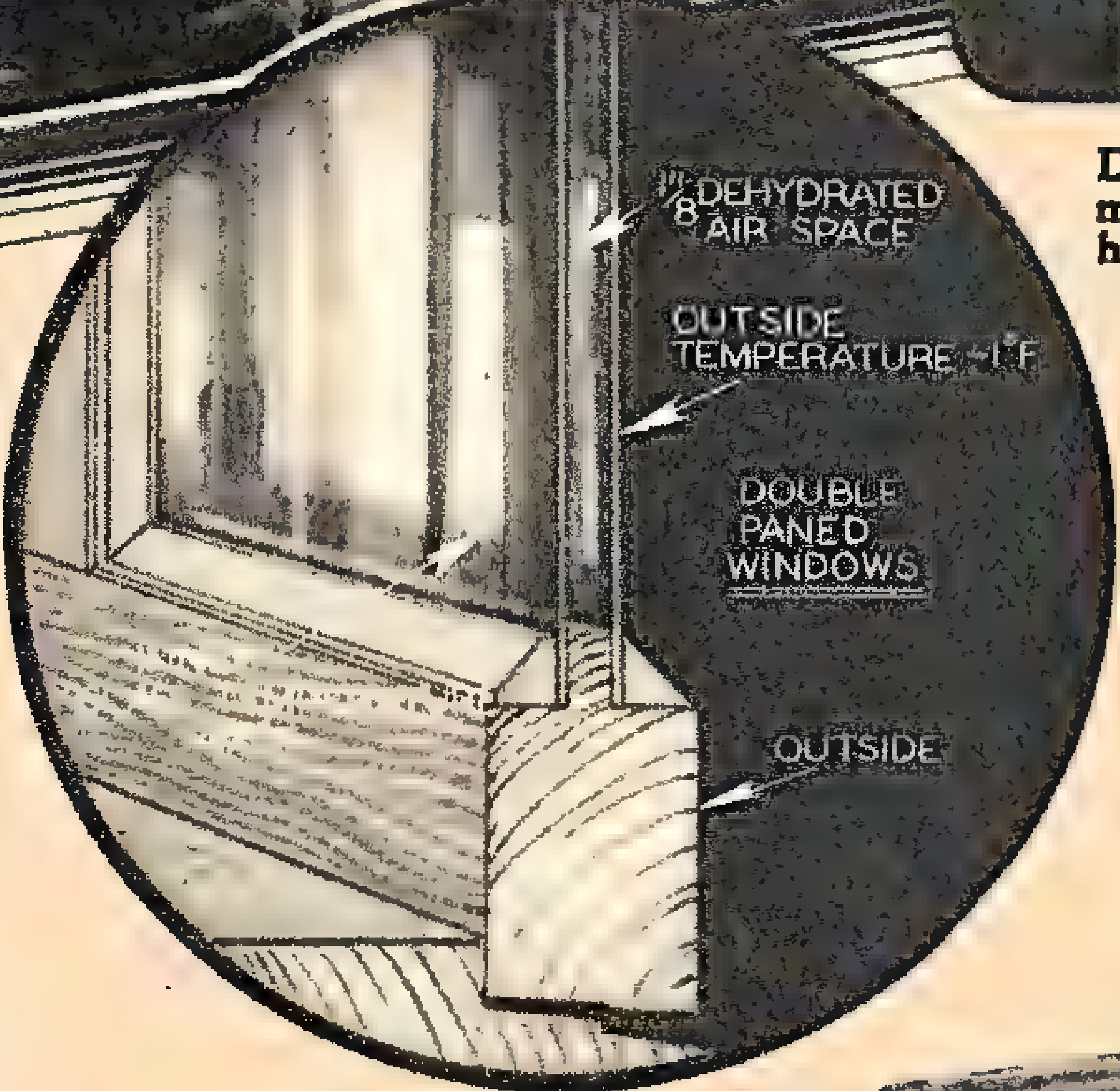
Air-conditioning and the new insulations it has inspired, form one of the most interesting chapters in this new building drama. Just recently, engineers dusted off an old scientific principle and put it to work to make modern

Aluminum House Armor Keeps Out Summer Heat, Holds Winter Warmth

Shining armor of aluminum is being applied to outside wall of this house to reflect summer heat rays and bounce heat back into the house during the winter.



Drawings above show how aluminum sheeting protects the home during summer or winter.



Above—New double-paned window reduces loss of heat. Right—Aluminum lath material has reflecting heat side and dull side for plaster.

houses warmer in winter and cooler in summer.

That principle is this—a bright, dense metal surface reflects heat rays much as it does light rays. A razor-thin film of gleaming aluminum, 95/1000 of an inch thick, to be exact, has been applied to building paper, lathing material, sheet rock and other substances to serve as effective insulation. Properly applied, with allowance for air space so that the metal does not actually touch the bulk of the rest of the wall, this "magic armor" bounces the heat rays back when they try to get into the house in summer and bounces them back inside when they try to leak out in winter. If the heat rays can be controlled, the problem of human comfort largely has been solved. Tests with these metallized materials show that they have the insulating equivalent of twelve inches of brick or twenty inches of concrete. So far as can be determined, the metal will last indefinitely. As long as it stays bright and shiny, and the engineers say it should not get black when properly installed, it serves as a reliable and economical protector.

There's an equally interesting story in a new double-paned window now on the market to replace the usual storm windows. The inventor, by the way, worked it out first as an idea for store counters and refrigerator doors. He applied it to houses and just the other day, a large manufacturer bought him out. New ideas for house materials are promising money-makers!

This double-paned window not only prevents heat losses in winter but it ends frosting and condensation on window glass. The two panes of good, clear glass are held apart a fraction of an inch by a special material which expands and contracts but doesn't crack or break. Between the panes is a layer of

[*Continued on page* 126]

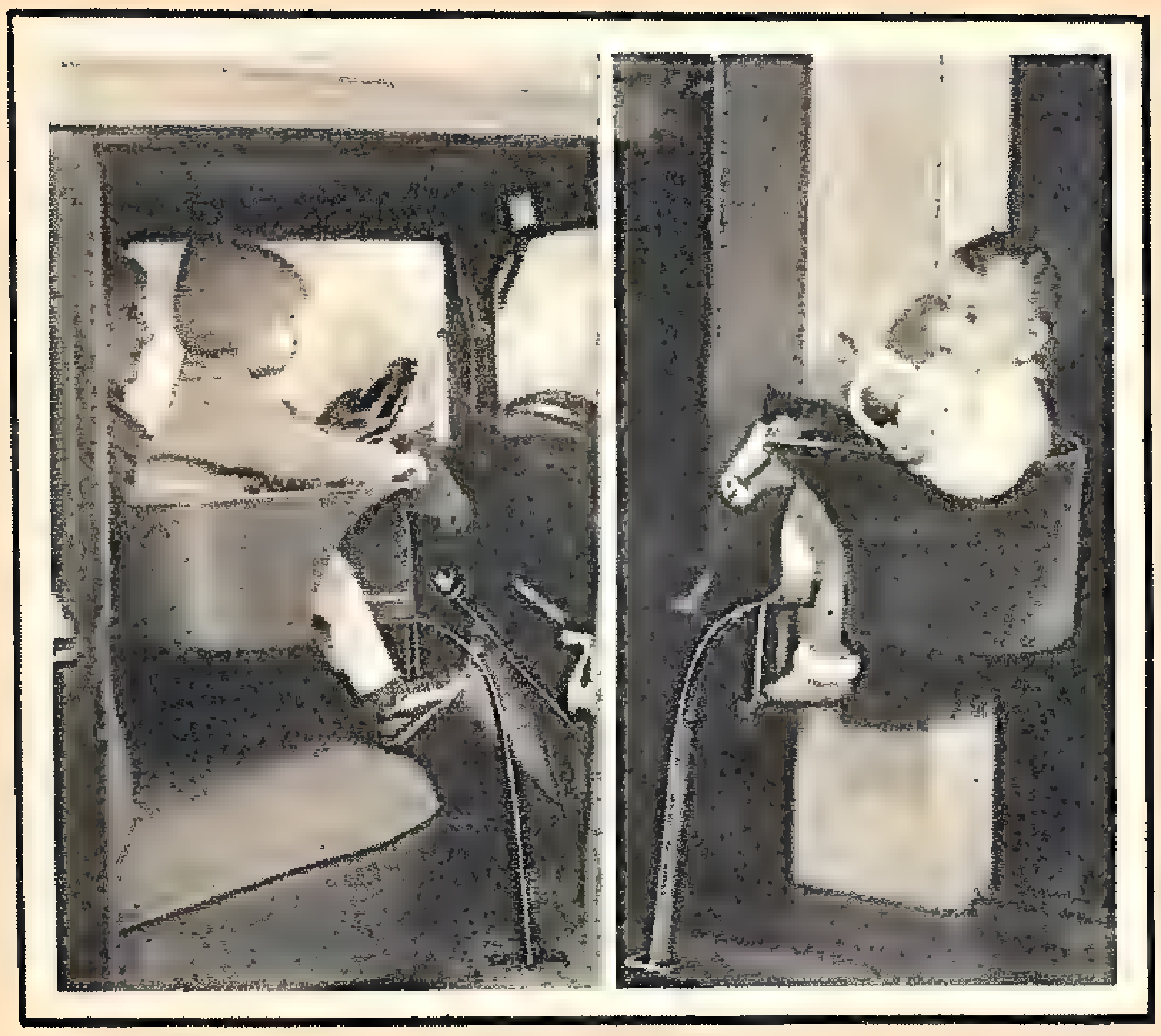
New Projector Throws Illustrations Behind Speaker's Back

FACING the audience as he talks, a speaker may now illustrate his lectures on a screen behind him without turning around with the aid of a novel optical projector recently perfected by a well known German firm.

The speaker, directly facing his audience, illustrates his talk by writing or drawing horizontally on a sheet of cellophane lying on a glass table before him, and the script is projected, ten to fourteen times enlarged, on the wall screen behind him.

Underneath the glass table, the light of a 500-watt bulb is condensed and reflected through the transparent cellophane. The lines then pass through a lens to the mirror and are projected onto the screen.

Baby Bounces in Safety Chair

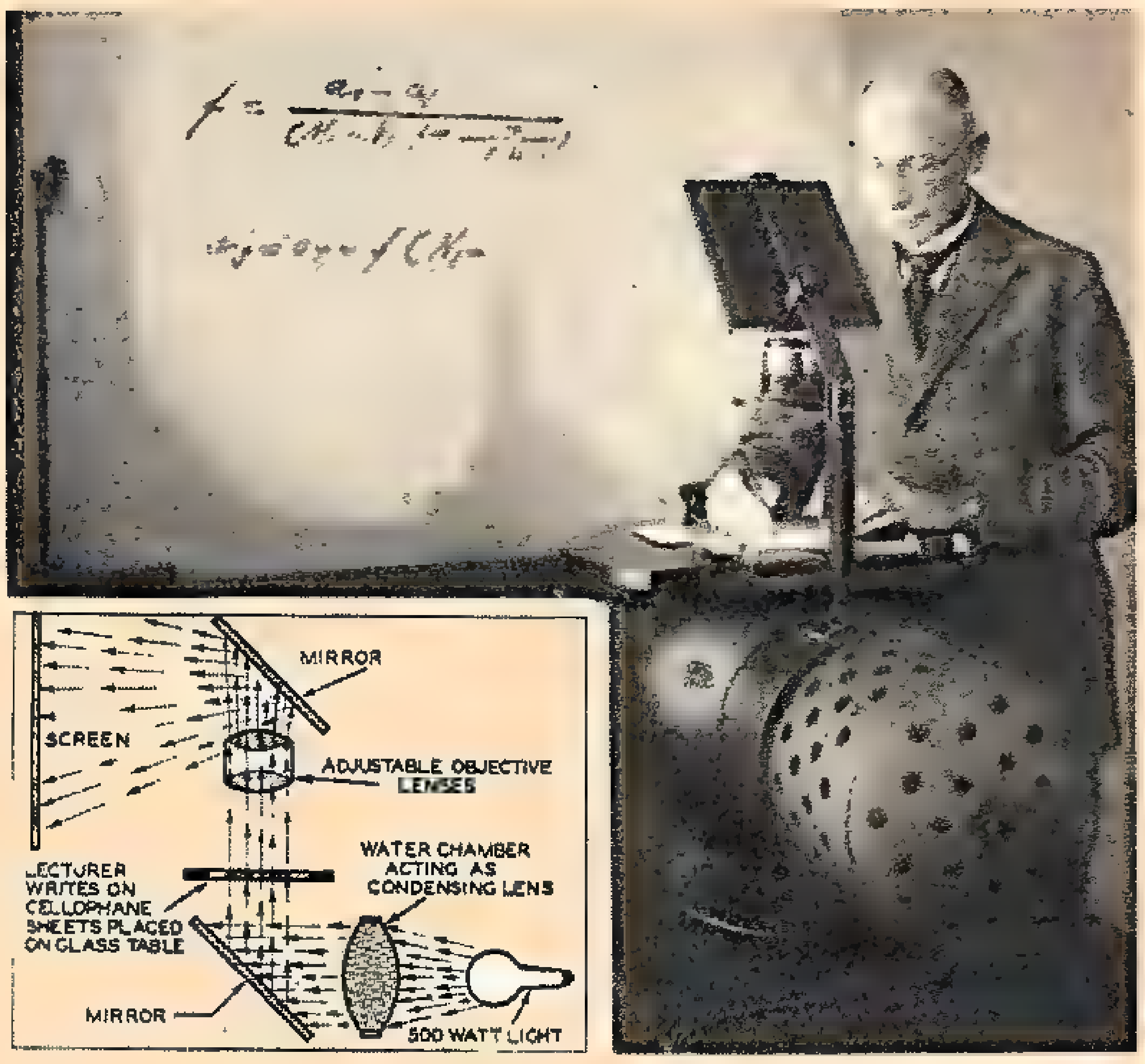


Right—The safety chair is supported by a spring leaf slipped into a slot on the floor. Left—The chair used in an auto.

A SAFETY chair which combines the enjoyment of a spring ride for the baby with assurance to the mother that he will not get hurt provides a solution to the problem of baby tending for the busy housewife.

The chair is built high to support the baby's back and is set on a strong steel spring leaf fastened to a slot in the floor. The baby's legs straddle a hobby-horse head which prevent him from falling out of the front. Stirrups provide a natural rest for the child's feet.

The spring of the safety chair may also be slipped into a slot in the auto floor, and it will eliminate all heavy shocks to provide baby with a smooth, comfortable ride in spite of rough and rutty roads.


MIRROR
SCREEN
ADJUSTABLE OBJECTIVE LENSES
WATER CHAMBER ACTING AS CONDENSING LENS
LECTURER WRITES ON CELLOPHANE SHEETS PLACED ON GLASS TABLE
MIRROR
500 WATT LIGHT

A lecturer illustrating the use of the new projector. Lower left—A diagram showing the basic action of the projector.

Pole Affects Radio Wave Speed

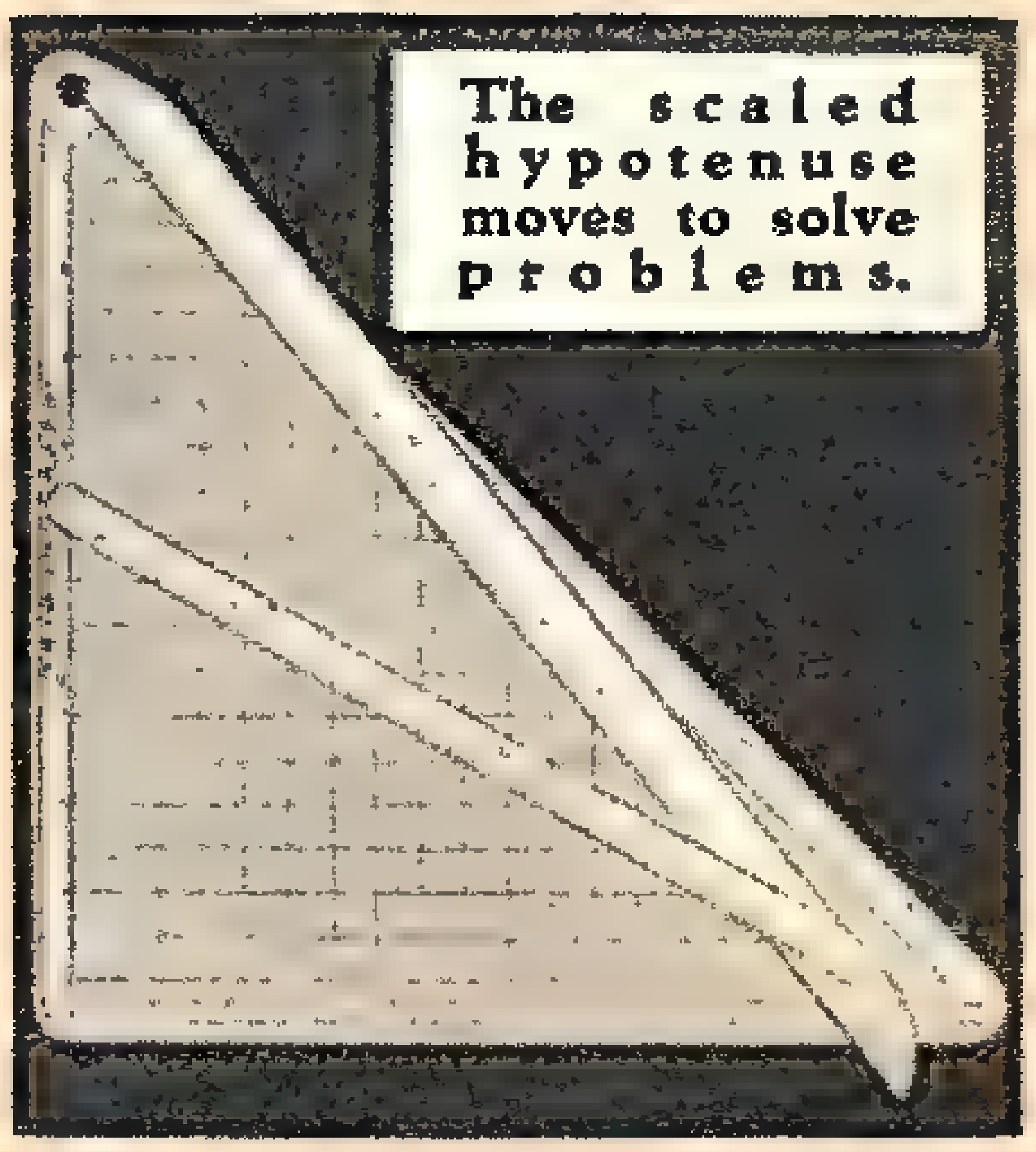
THE theory that radio waves cross the Atlantic with the speed of light, 186,000 miles per second, was shattered recently with the discovery by Dr. H. T. Stetson that they sometimes travel at a rate only half that great.

It is believed that the speed of radio waves is decreased as their course of travel nears the earth's magnetic north pole. This discovery destroys the scientists' method of computing distance by the speed of radio waves.

Instrument Solves Math Problems

PROBLEMS in trigonometry are said to be easily solved without numerical calculation by a triangular mechanical calculator recently devised for students, instructors, engineers and draftsmen.

A movable hypotenuse, divided into decimal parts of an inch, is attached to a right triangle having a scale of degrees. By setting the hypotenuse and extra ruler to the known constants of a triangle, the unknown sides and angles can be read off directly to an accuracy of two or three decimal points in a short time.



The scaled hypotenuse moves to solve problems.

50 Year FIRE Endangers TOWN

Overnight cistern of this home became belching smokestack for raging coal fire far below, compelling owner to tear down home, piece by piece, and move it hurriedly to more solid location.

Though undergroud fire is burning all around, this oil well near New Straitsville, Ohio, is still producing. Road suddenly sank five feet here (at darker part) and had to be filled in.

Where fire broke through into coal mine being worked by small group of miners, forcing them to flee or be burned. Underground fire now covers six-mile area. Mile-long cracks have opened across the hills, with open fire visible below.

FORTUNES have been spent in futile efforts to stop a great underground fire which day by day creeps closer to the busy town of New Straitsville, Ohio. Started in a coal mine some fifty years ago by striking miners, the fire has spread from one coal vein to another, creating great pits in the surrounding country, splitting hills open, and undermining buildings. The town itself is in grave danger of sinking, building by building, into the raging inferno.

Cement walls sunk into the earth have not stopped the constant gnawing of flames. All known crevices have been sealed and steam forced into the great labyrinths to no avail. Creeks have been diverted into the mines in futile attempts to drown out this persistent and deadly fire. Valuable forests have been stunted or killed by the heat.

One unlucky home owner in the vicinity woke up in the morning to find his cistern full of fire instead of water, and the foundations of his home sinking into the flaming pits. Needless to say, his home and belongings were moved forthright.

The federal government has become interested in attempts to save New Straitsville. Modern fire-fighting equipment used under the supervision of the United States Bureau of Mines is expected to conquer at last the fire which has dropped property values almost to zero in the vicinity, and which has for half a century enshrouded homes and stores alike in a veil of murky smoke and lethal gases.

Fake Cats Scare Birds and Mice to Save Scotchman's Crop

CRAFTY are the birds and field mice that eat the farmer's seed as it is planted; craftier than they is William H. Randall, a land-owner in Southern Scotland who, finding the futile flutterings of the ordinary scarecrow a poor guard against hungry scavengers, has enlisted the aid of an army of cardboard cats to guard his crops.

Painted white on one side and black on the other with grotesque eyes and whiskers, they are almost perfect crop savers.

The cats are cut from stiff cardboard and nailed to laths so that they may be set in the soft soil of a newly planted field. After the seeds have germinated and formed roots, the cats are pulled up and saved for the next sowing.

Randall and his family are shown setting up cardboard cats to keep birds and mice from digging the newly planted seed from the ground.

Paste Removes Old House Paint

A NEW paint remover, manufactured in the form of a paste, is produced especially for exterior use and is applied directly over the old paint by means of a brush.

It is said to have a distinct advantage over the old methods of scraping or using a blow torch. It can be used on a windy day, and it immediately provides a smooth surface for paint without preliminary sanding. Two coats of paint cover it easily, whereas it takes three to cover a torch charred surface.

Using the new paste, the old paint is easily scraped off with a putty knife five minutes after application.

Wire Web Controls Alarm Bell

FINE electric wires stretched across the room in spiderweb fashion and connected to a master wire sensitive to the slightest change in tension feature the new burgular and fire alarm perfected by a French inventor.

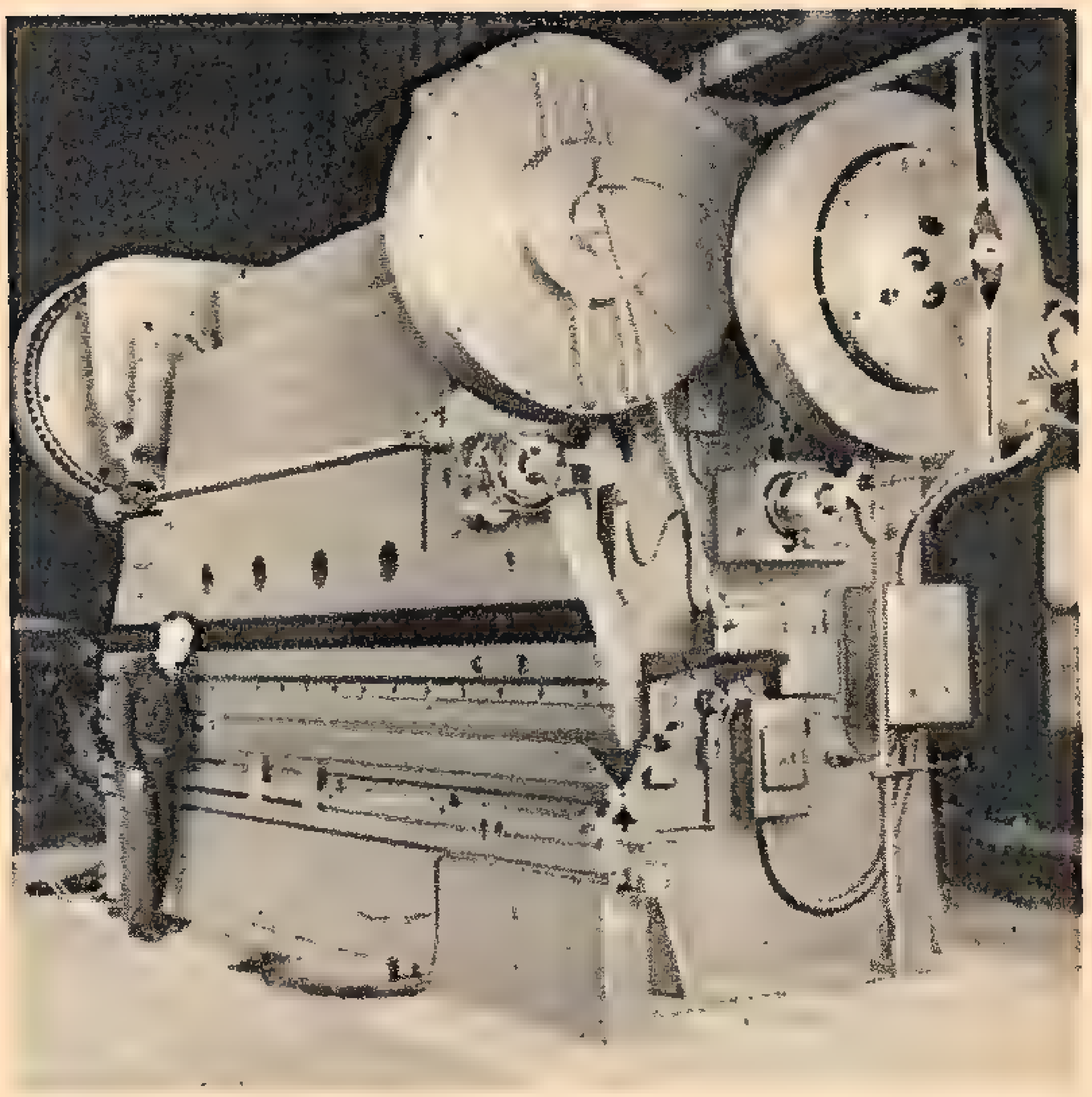
The wires are fastened to all the doors and windows of the room and pulled to the desired degree of tautness by closing the door as the owner leaves the room. If the door is opened again, the slack wires contact to set off an alarm. Soft metal connections melt to release the wires in case of fire.

Build One Thousand Ton Press

DRIVEN by a 50-horsepower high torque motor, a huge new punch press, the largest of its kind in the world, will develop the tremendous pressure of 2,000,000 pounds, enough to bend a cold steel plate one inch thick and twelve feet long or a plate eighteen feet long and ¾ of an inch thick.

The ram has a six inch stroke and a six inch adjustment with a distance, bed to ram, of 14 inches. A gear shift transmission permits regulation of speed from five to twenty strokes per minute.

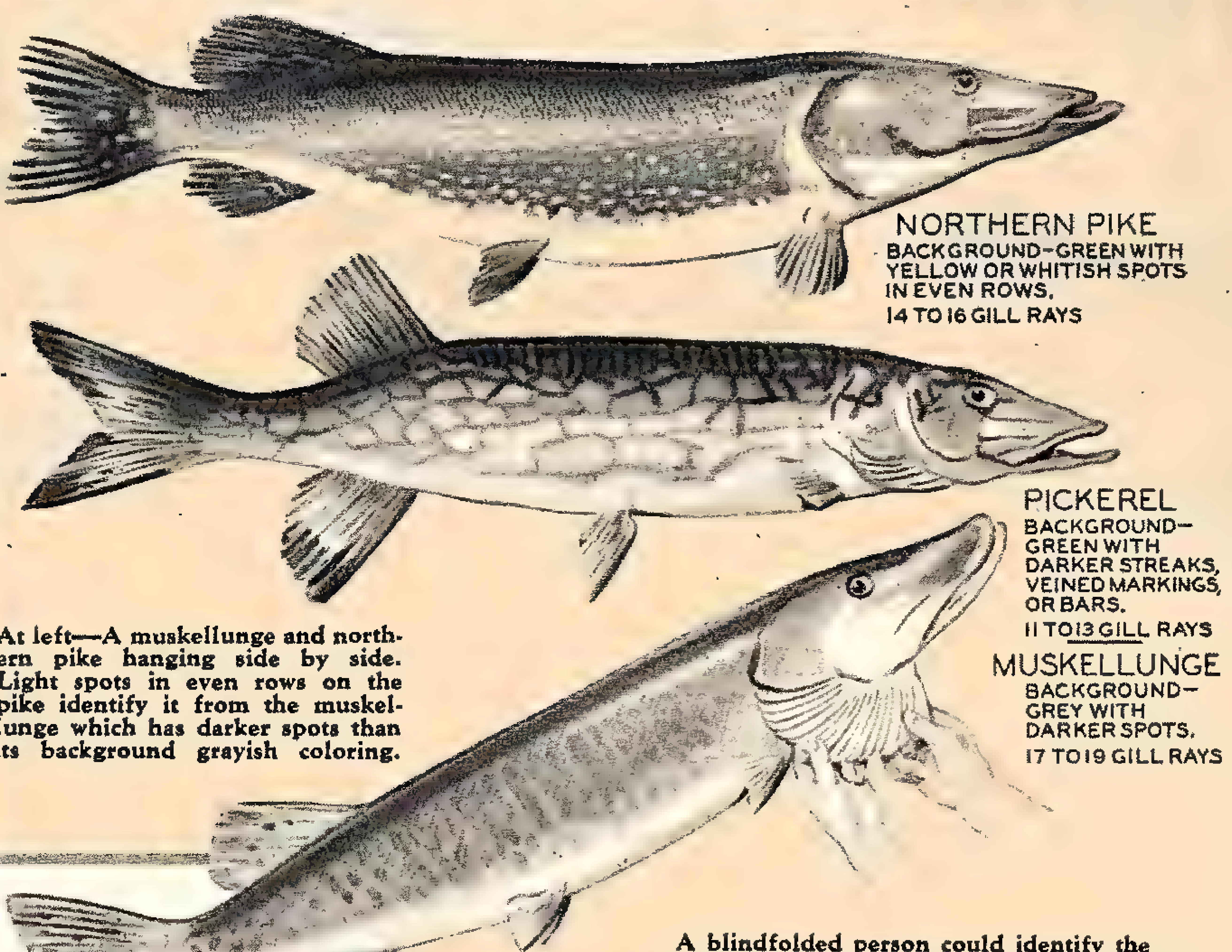
A huge ball-bearing under the flywheel is 56 inches in diameter, weighs 4,000 pounds, and runs at a speed of 600 revolutions per minutes. The punch is conveniently operated from any one of several control switches.



A view of new press. It will develop a pressure of 2,000,000 pounds to bend and form cold steel plates of unusual thicknesses. It will also handle welded steel for machine parts.

CAN YOU IDENTIFY

At left—A muskellunge and northern pike hanging side by side. Light spots in even rows on the pike identify it from the muskellunge which has darker spots than its background grayish coloring.

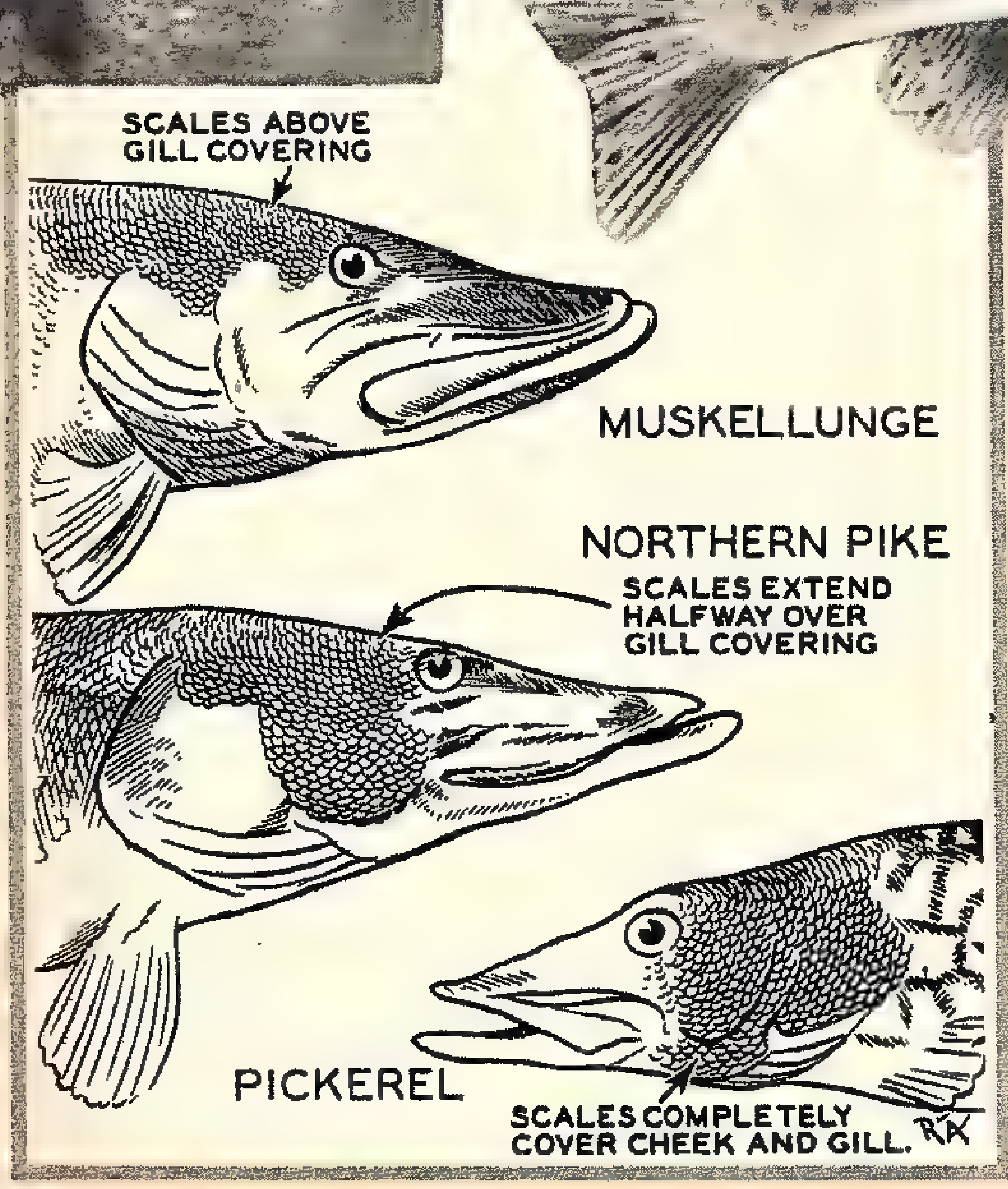

NORTHERN PIKE
BACKGROUND—GREEN WITH YELLOW OR WHITISH SPOTS IN EVEN ROWS.
14 TO 16 GILL RAYS
PICKEREL
BACKGROUND—GREEN WITH DARKER STREAKS, VEINED MARKINGS, OR BARS.
11 TO 13 GILL RAYS
MUSKELLUNGE
BACKGROUND—GREY WITH DARKER SPOTS.
17 TO 19 GILL RAYS

A blindfolded person could identify the three pike members by counting the gill rays or bones as shown in above sketch.

SURPRISING as it may seem many fishermen can not specifically name the fish they catch. They will say, "It looks like a perch" or "It's a bass," but whether it is a large mouth or small mouth, they can not say.

In some ways this is true even among experienced fishermen. Some of them can not distinguish between the pickerel and the northern pike, and the northern pike and the muskellunge.

No greater confusion exists than in identifying the members of the pike family which includes three species, the muskellunge, great northern pike, and pickerel. The tendency is to bracket the great northern pike and the three members of the true pickerel species into one. In the same way the muskellunge and the great northern pike have been confused. Some fishermen believe that when a great northern pike grows large in size, it becomes, not a pike, but a muskellunge. Hence we often see a large pike panned off


SCALES ABOVE GILL COVERING
MUSKELLUNGE
NORTHERN PIKE
SCALES EXTEND HALFWAY OVER GILL COVERING
PICKEREL
SCALES COMPLETELY COVER CHEEK AND GILL.
RK

To identify pike family note the scale covering on the cheeks and gill covers. The lower half of the cheeks and gill covers are free of scales in the muskellunge, while the cheek of northern pike is completely scaled, but only half the gill is covered. Both cheek and gill are completely scaled in pickerel.

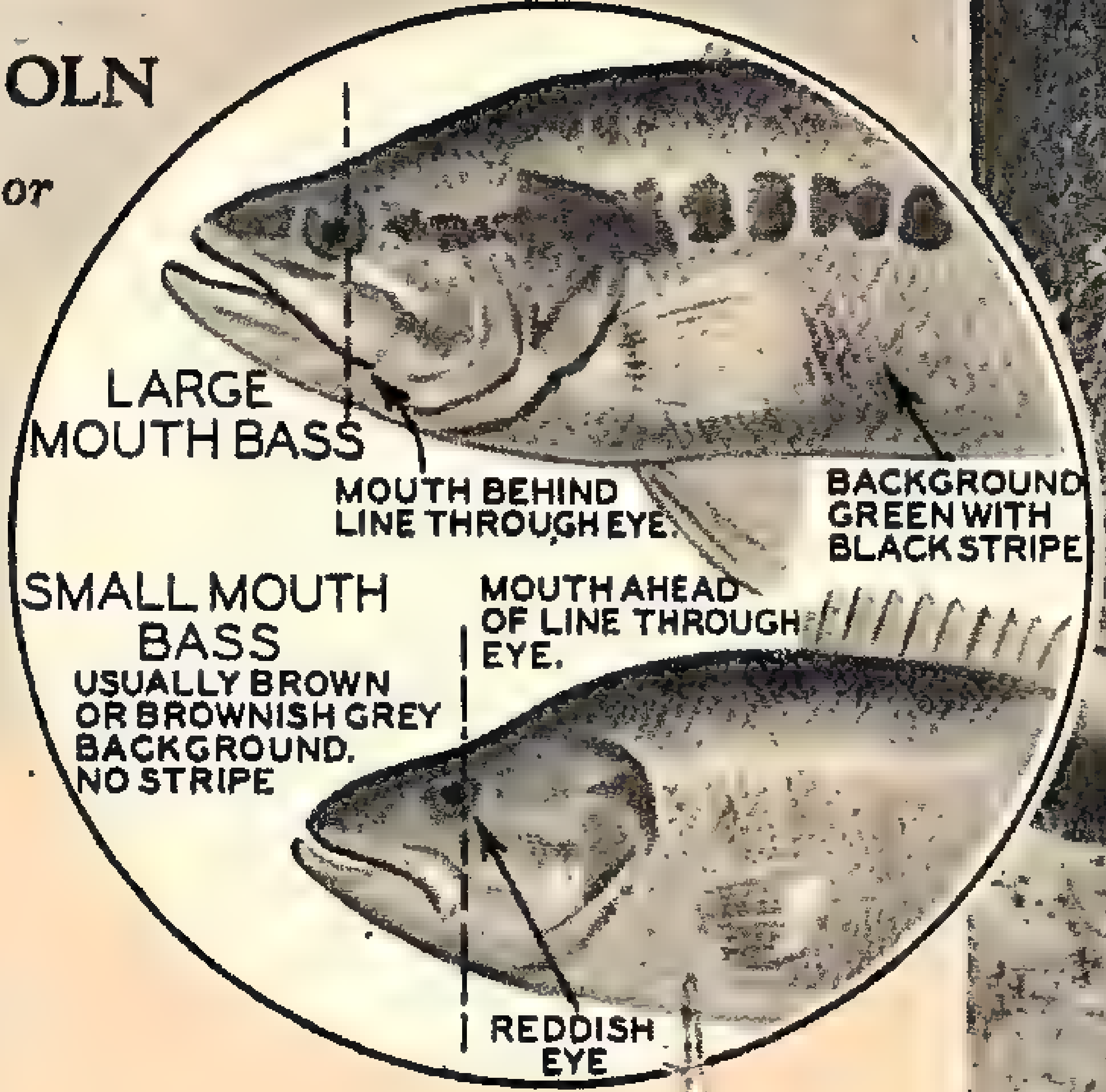
THE FISH YOU CATCH?

by

ROBERT PAGE LINCOLN

Hunting and Fishing Editor

The "pickerel" you are catching may be small northern pike. Although you may know your fish, the statements of this expert may surprise you.


LARGE MOUTH BASS
MOUTH BEHIND LINE THROUGH EYE.
BACKGROUND GREEN WITH BLACK STRIPE
SMALL MOUTH BASS
USUALLY BROWN OR BROWNISH GREY BACKGROUND. NO STRIPE
MOUTH AHEAD OF LINE THROUGH EYE.
REDDISH EYE

Line drawn through eye of bass, as shown at right, will distinguish small mouth from the large mouth. Red eye of small mouth will identify it. Scales of small mouth bass are small.

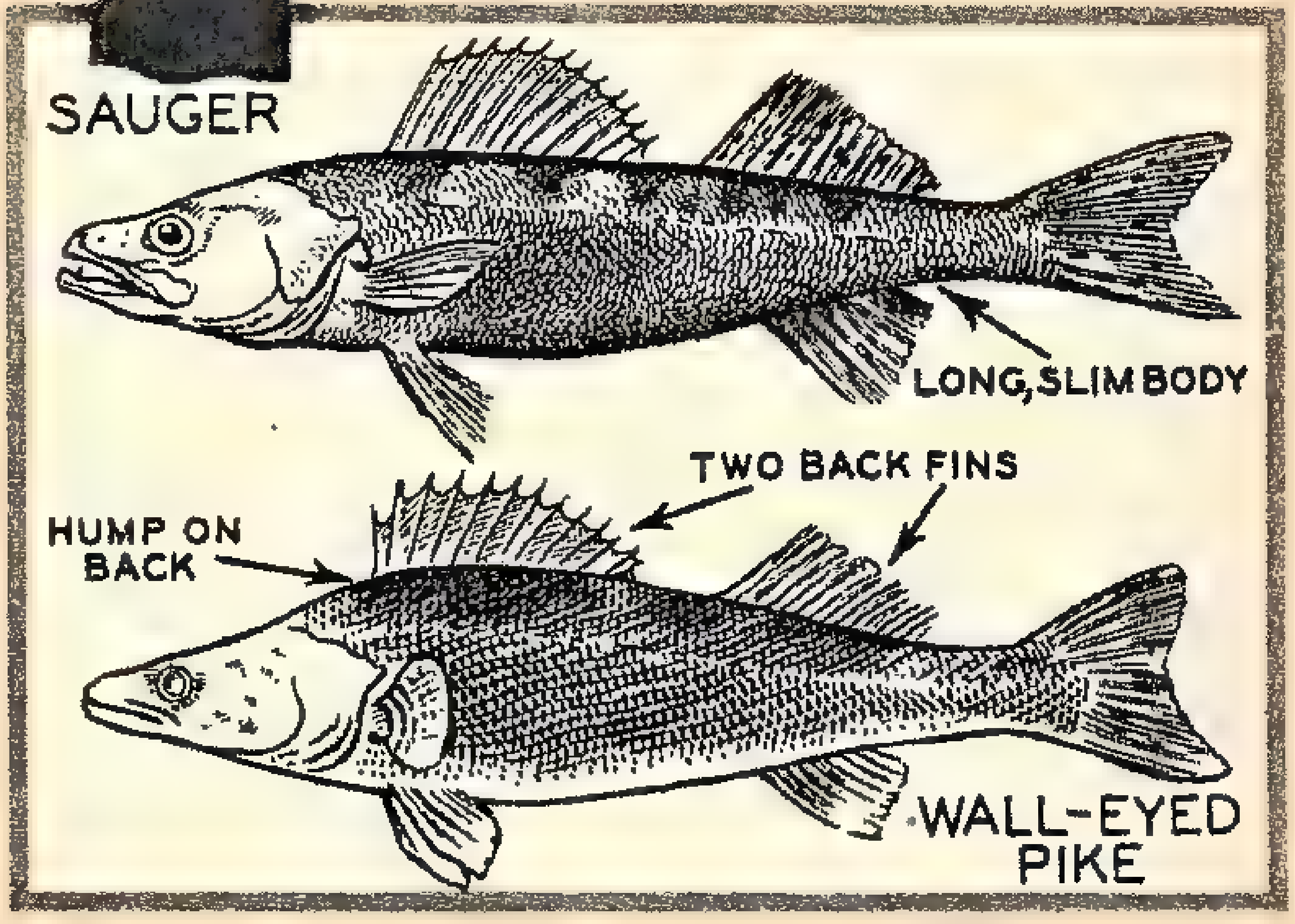
as muskellunge. Every fisherman to gain the most out of the fishing pastime should know the fish he angles for!

While there are three varieties of the muskellunge in North America (the only place in the world where the species is found), they are all very much alike, save for a few varying spots, blotches, or bars on the body. The three varieties are: the northern or unspotted muskellunge (*Esox immaculatus*); the spotted or St. Lawrence muskellunge (*Esox masquinongy*); and the Chautauqua muskellunge (*Esox ohioensis*). All three may be found hobnobbing in common in the same water. The fisherman should know that a muskellunge is a muskellunge whether it is unspotted, spotted, barred, or striped.

So far as size and length is concerned, the great northern pike rarely comes up to the mark set by the muskellunge. Following the same line of comparison it may be said that few true pickerel ever get as large as a six or eight pound great northern pike. Most pickerel range around a foot to fourteen inches in length.

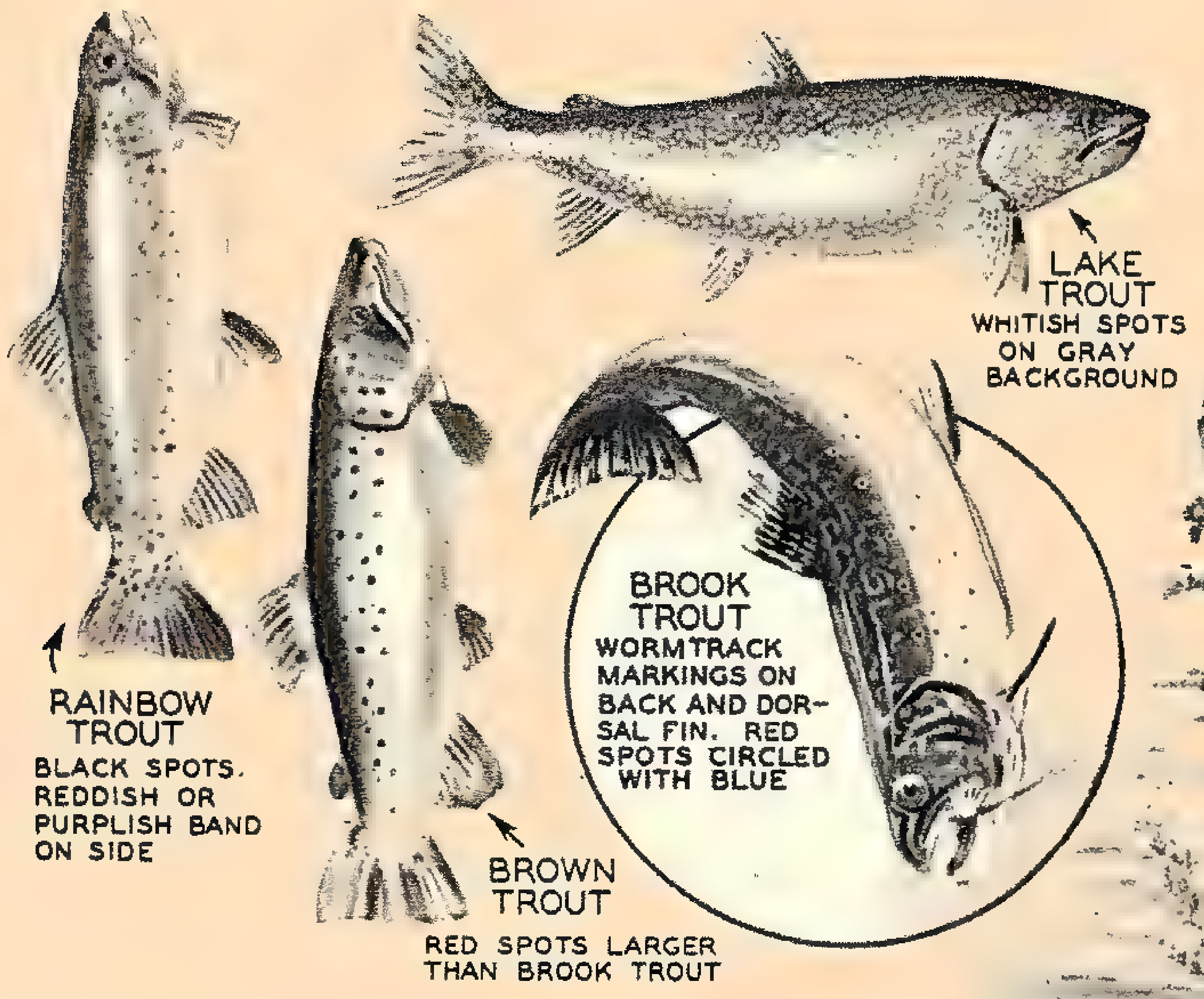
In coloration alone the muskellunge differs from the great northern pike, the only fish with which it could possibly be confused. The background coloration of the muskellunge is some shade of gray, either light or dark gray, whereas the pike is green in background color,

Above is an excellent specimen of a muskellunge caught by the author. It weighed 35 pounds. It was partly blotched or spotted with wavy streaks. At left is a large mouth bass. Note its flabby stomach which is not found in the small mouth bass. The background coloring of the large mouth is green.


SAUGER
LONG, SLIM BODY
TWO BACK FINS
HUMP ON BACK
WALL-EYED PIKE

The wall-eyed pike and sauger are really members of the perch family. Both look much alike. The sauger, however, is a slimmer fish, is lighter in coloring, and usually weighs less. The body of the wall-eye is rough. Pike family members have slimy scale covering and have just one back fin.

MARKINGS IDENTIFY Four Species of TROUT


LAKE TROUT
WHITISH SPOTS ON GRAY BACKGROUND
BROOK TROUT
WORMTRACK MARKINGS ON BACK AND DORSAL FIN. RED SPOTS CIRCLED WITH BLUE
RAINBOW TROUT
BLACK SPOTS. REDDISH OR PURPLISH BAND ON SIDE
BROWN TROUT
RED SPOTS LARGER THAN BROOK TROUT

Distinguishing characteristics of four trout commonly found in American waters are shown above. Brown and brook trout may be confused, but the latter has small scales scarcely seen with the eye, small red spots, and worm-track marked fins.

This 34-lb. lake trout was caught in the Lake of the Woods, Minn. Except at the tail, most of its spots have vanished.

sometimes light green and sometimes dark green depending upon the water from which it is taken.

On the grayish background coloration of the muskellunge there are darker spots or blotches. In comparison, the spots on the great northern pike, instead of being dark, are pale yellow or whitish and are set more or less evenly in rows up and down the sides. These rows of spots on the side are possessed alone by the pike; the muskellunge does not have them, nor do any of the true pickerel. These rows of light, yellowish spots should at once set the pike apart from the other members of the pike family.

Two unfailing means of recognizing the members of the pike family is to take note of the scaling on the cheeks and gill covers and to count the number of rays or bones in the gill covers or opercles.

In the muskellunge the upper part of the cheeks and the gill covers are scaled, the lower half of each being free from scales. In the great northern pike the cheeks are completely scaled, but the lower half of the gill covers are bare of scales. In the three true pickerel both the gill covers and cheeks are covered with scales!

Spread the gill cover of a member of the pike family whose identity you wish to establish. By running your finger and thumb along the lower edge of it you will note the bones that line it, being about a fourth of an inch apart. These bones, or branchiostegal rays, as they are called, aid the fish in opening and closing the gill covers as it breathes. The number of bones in this gill cover tells you what sort of fish you have.

In the muskellunge each gill cover, left or right on the fish, contains each 17 to 19 of these rays. The great northern pike ranges 14 to 16, while all three pickerel have 11 to 13 rays in each gill cover. It is interesting to state that one should be able to tell any of the three members of the pike family apart with eyes closed, merely by running the fingers over the gill cover edges and counting the number of rays that each possesses!

There are three pickerel recognized in this country, namely, the eastern or chain pickerel (*Esox reticulatus*); the little pickerel, or

[*Continued on page* 124]

Following the Birds on their Migratory Trek

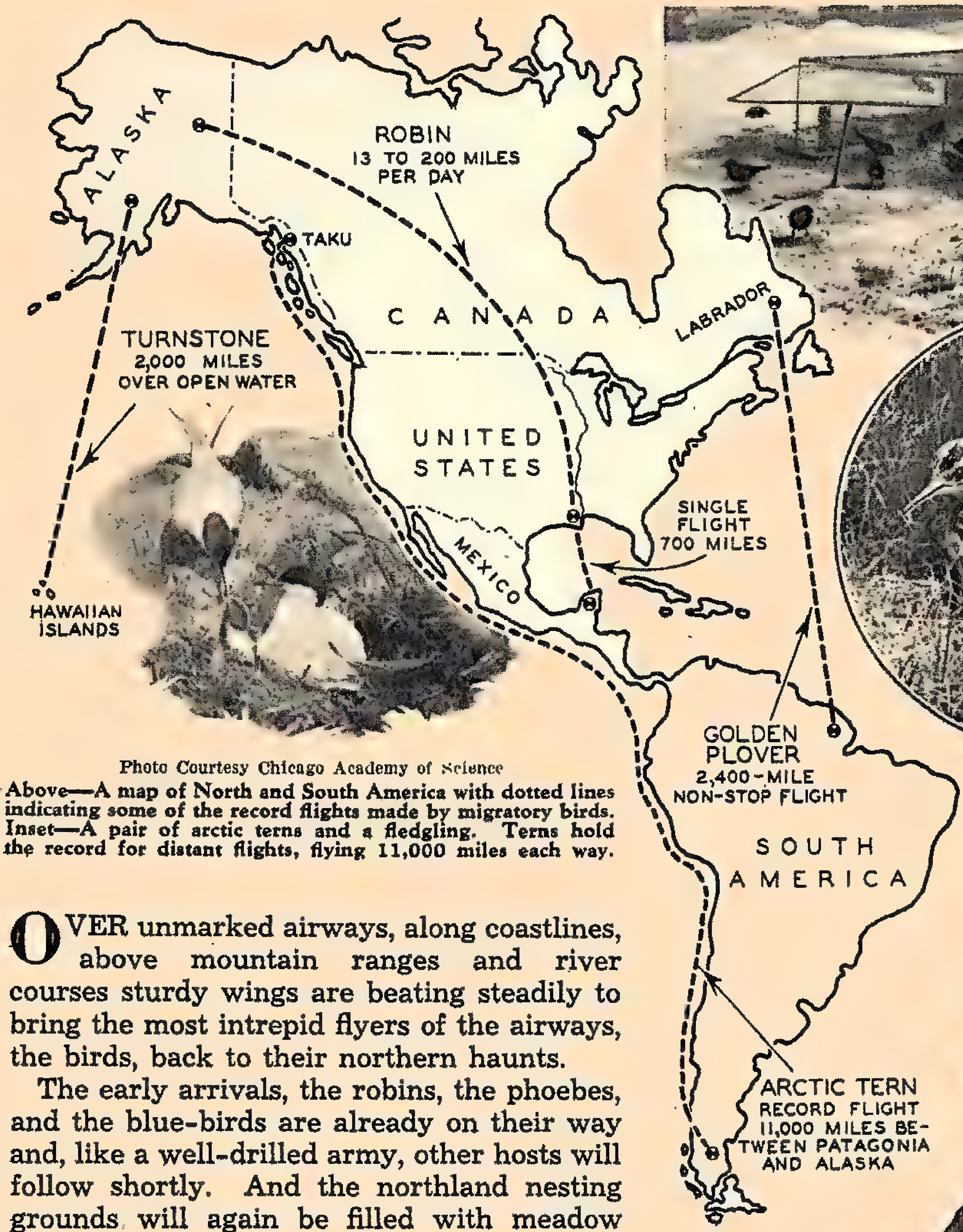

ALASKA
ROBIN
13 TO 200 MILES PER DAY
TAKU
CANADA
LABRADOR
TURNSTONE
2,000 MILES OVER OPEN WATER
UNITED STATES
SINGLE FLIGHT 700 MILES
MEXICO
HAWAIIAN ISLANDS
GOLDEN PLOVER
2,400-MILE NON-STOP FLIGHT
SOUTH AMERICA
ARCTIC TERN
RECORD FLIGHT 11,000 MILES BETWEEN PATAGONIA AND ALASKA

Photo Courtesy Chicago Academy of Science

Above—A map of North and South America with dotted lines indicating some of the record flights made by migratory birds. Inset—A pair of arctic terns and a fledgling. Terns hold the record for distant flights, flying 11,000 miles each way.

Photo Courtesy Chicago Academy of Science

Above—Juncos and finches feeding around a trap. In circle—An upland plover on her nest near Chicago. The upland plover spends his summers in North America and winters in Argentina.

OVER unmarked airways, along coastlines, above mountain ranges and river courses sturdy wings are beating steadily to bring the most intrepid flyers of the airways, the birds, back to their northern haunts.

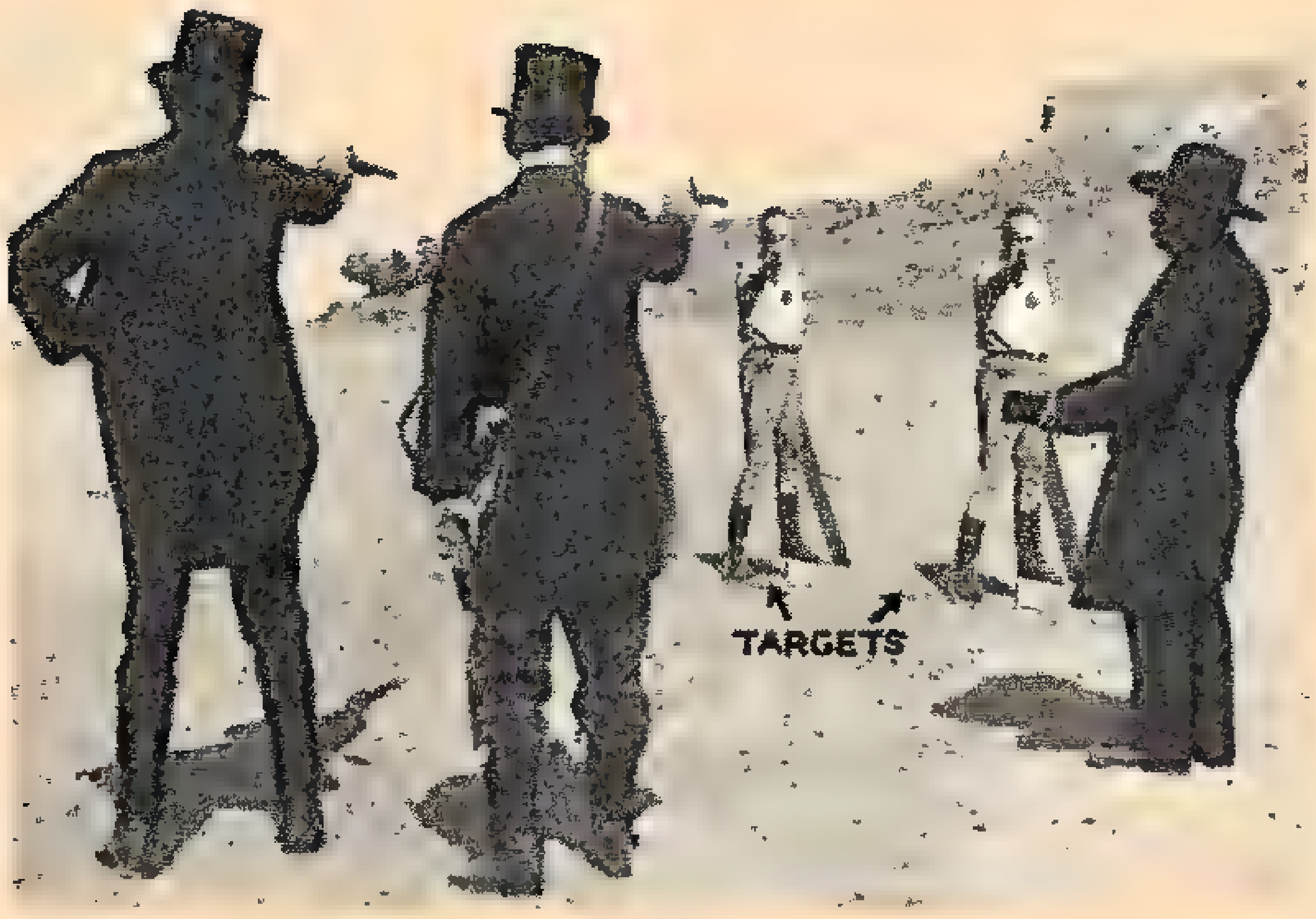
The early arrivals, the robins, the phoebes, and the blue-birds are already on their way and, like a well-drilled army, other hosts will follow shortly. And the northland nesting grounds will again be filled with meadow larks, warblers, thrushes, swallows, swifts, martins, orioles, and countless other migratory birds.

It is a strange movement, this annual migration of the birds. Man gasps in amazement at some of the feats the hardy travelers perform in their semi-annual trips ranging from 1,000 to 11,00 miles in length. Even the common robin and many of the other smaller birds make sustained trips of 700 miles without food, and the golden plover, flying between northern South America and Labrador, goes in a direct route, 2,400 miles over the open waters of the Atlantic, without food or rest. The turnstone, another trans-

[*Continued on page* 130]

Right—The photo shows a bird enthusiast attaching a band to the leg of a young herring gull. The bands are numbered, and a record is sent to the government Biological Survey telling the species of bird, the band number, and the locale in which he was found for future study.

Duelists Break Custom; Shoot Selves In Target Practice



A view of several members of the Southern California Collectors Association practicing on their life-sized enlargements.

QUITE contrary to the ancient custom of duelling, the members of the Southern California Colectors Association have evolved a bloodless version of the honorable art, using life-sized photographic enlargements of themselves as targets.

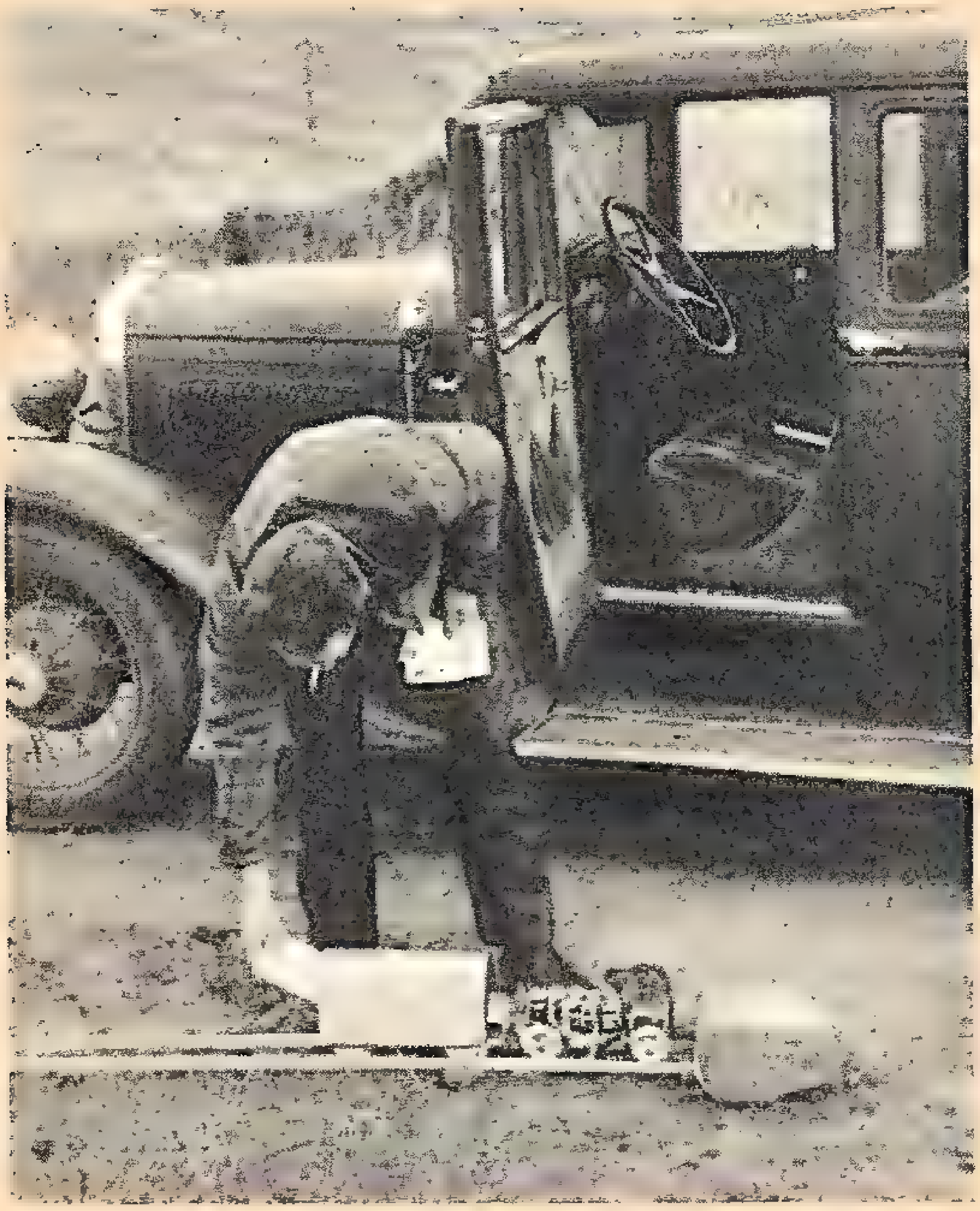
One of the club members, a photographer by profession, struck upon the idea, and now the members are staging regular contests, shooting with old guns from their collections.

A circle over the heart is the bull's eye; concentric circles extending over the other vital parts of the body provide a wide range scoring basis.

Toy Train Delivers Rural Mail

"NECESSITY is the mother of invention." An Oregon rancher, living a mile from the highway, proved the truth of this old maxim when he put the world's smallest mail train in operation over a spur line between his home and the road to save his wife the trip.

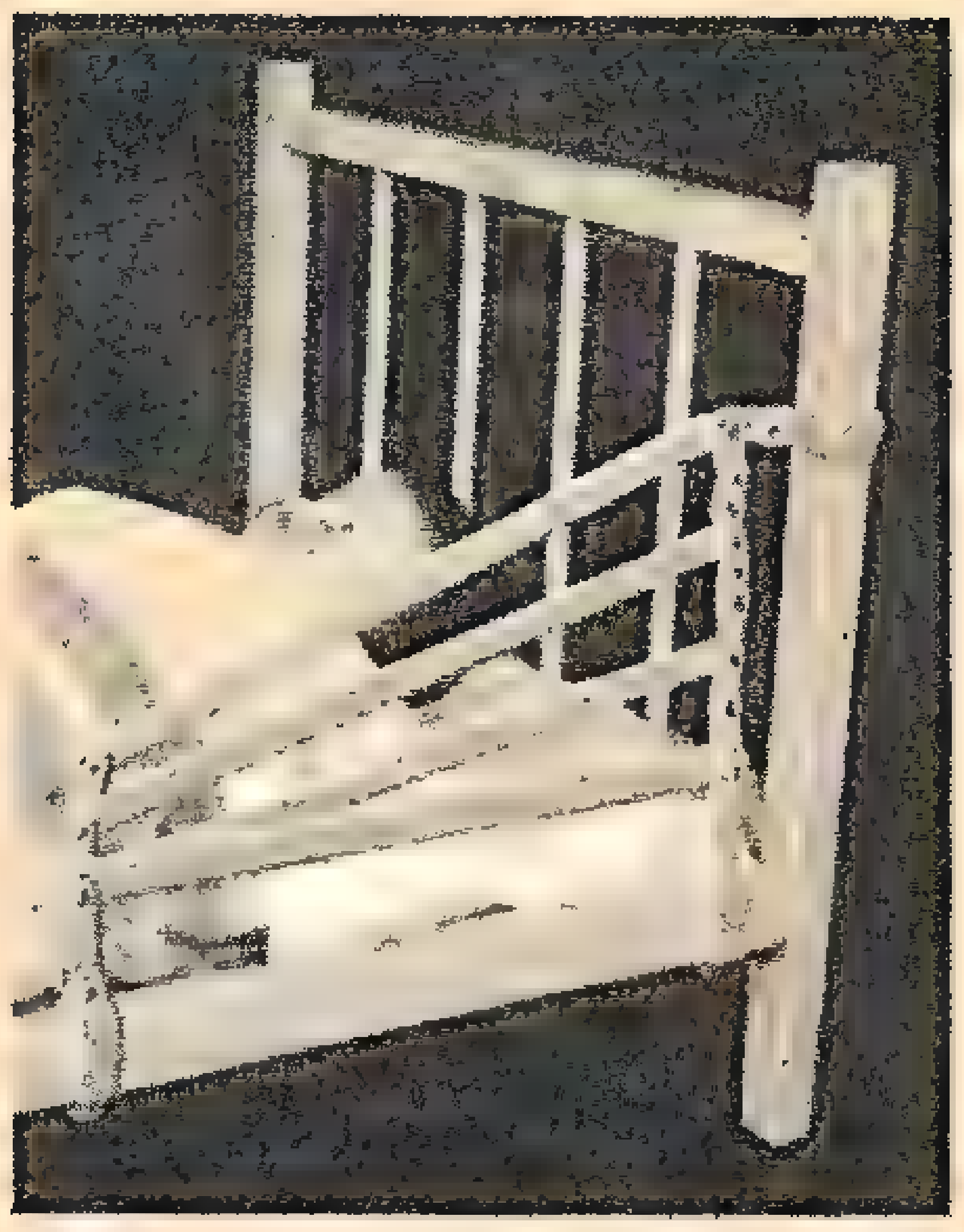
The train, powered with small dry-cell batteries, makes the trip to the road every morning, pulling a tiny mail box. Upon arrival, it is stopped by a lever laid along the track.



The mail man delivers his mail and turns the switch to send the world's smallest mail train on its mile journey homeward.

Folding Bed Sides Guard Baby

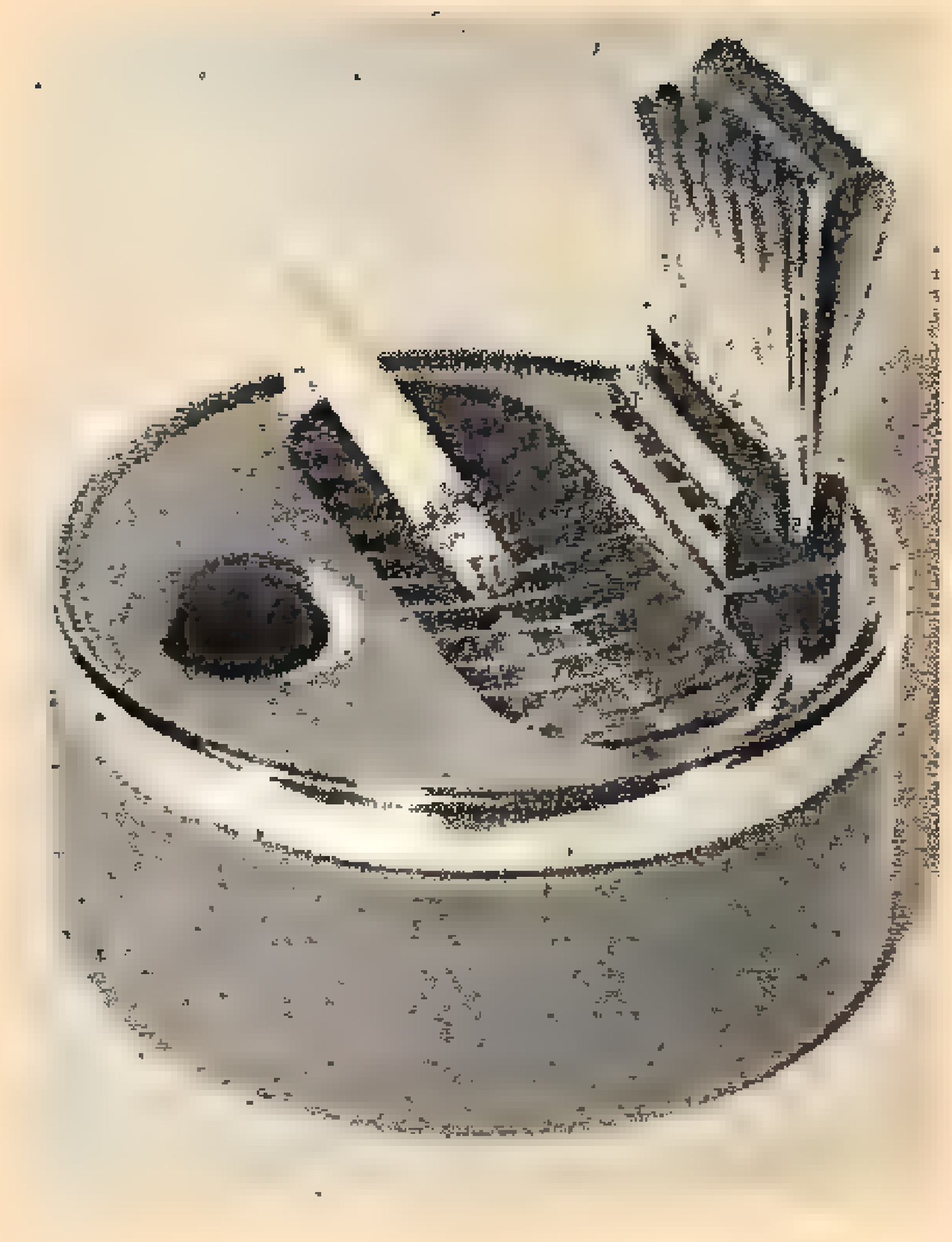
A COLLAPSIBLE guard to prevent restless children from falling out of bed can be quickly clamped to the bed by means of thumbscrews. It folds and lies unobstrusively below the mattress level when not in use as a safeguard for baby.



The collapsible bed-guard is quickly attached through the use of thumb screws on the bed post.

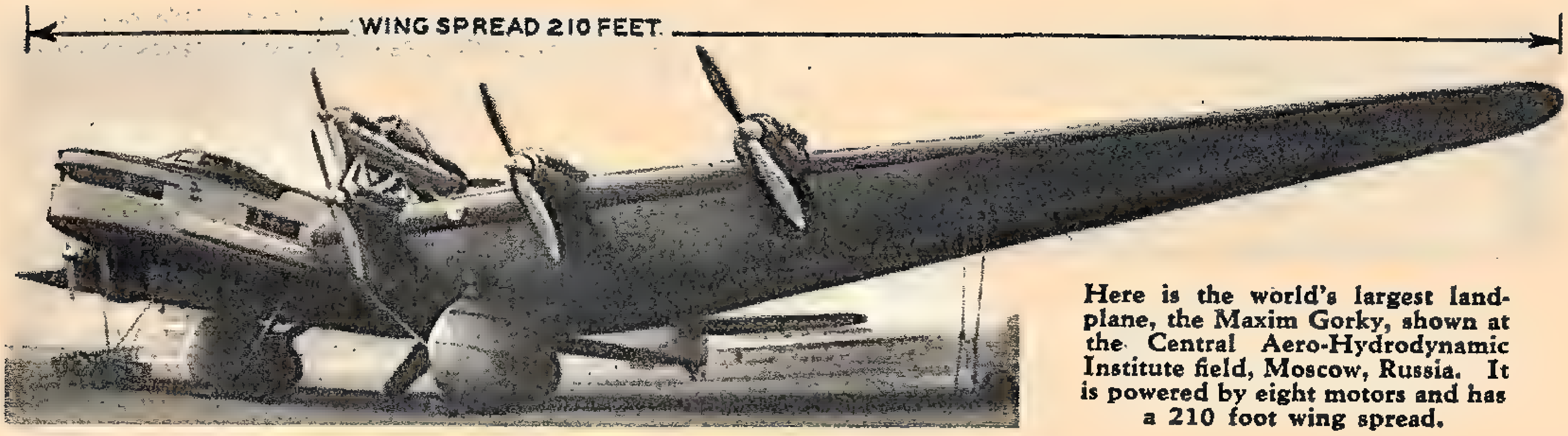
Ash Tray Protects Cigarettes

RANCID odors from burning cigarette stubs are said to be minimized through the use of an ash tray with separate compartments for the burning ash and the butt, preventing butts from smouldering. A grid on the top prevents condensation of moisture on the cigarette when it is laid aside, and it scrapes off lighted ends to extinguish cigarettes.



The grid on the tray is designed to avoid moisture condensation on the end of a burning cigarette.

Largest Plane Carries Printing Press



Here is the world's largest land-plane, the Maxim Gorky, shown at the Central Aero-Hydrodynamic Institute field, Moscow, Russia. It is powered by eight motors and has a 210 foot wing spread.

ROARING with all the power of its eight mighty engines, the huge Soviet Monoplane, Maxim Gorky, the world's largest landplane, recently trundled to a stop at the Central Aero-Hydrodynamic Institute field in Moscow for its first public appearance.

The Maxim Gorky, named after the famous Russian writer, has a wing spread of 210 feet—more than half the length of an average city block. It is propelled through the air by eight propellers which are driven by high compression motors, three in each wing and two set in tandem over the passenger cabin. The rear propeller is of the pusher type.

The plane will carry a useful load of from seven to eight tons at a top speed of 135 miles per hour. It has accommodations for 70 passengers and a crew of six, and carries a printing press to spread propaganda.

Design New Bicycle Speedometer

The new aluminum-finished bicycle speedometer registers mileage up to 9,999.9 and speeds up to 50 miles per hour.

TO MEET the demands of bicycle fans, a speedometer for bicycles has been invented which resembles an automobile speedometer in most respects, registering mileage up to 9,999.9 and speeds up to 50 miles per hour.

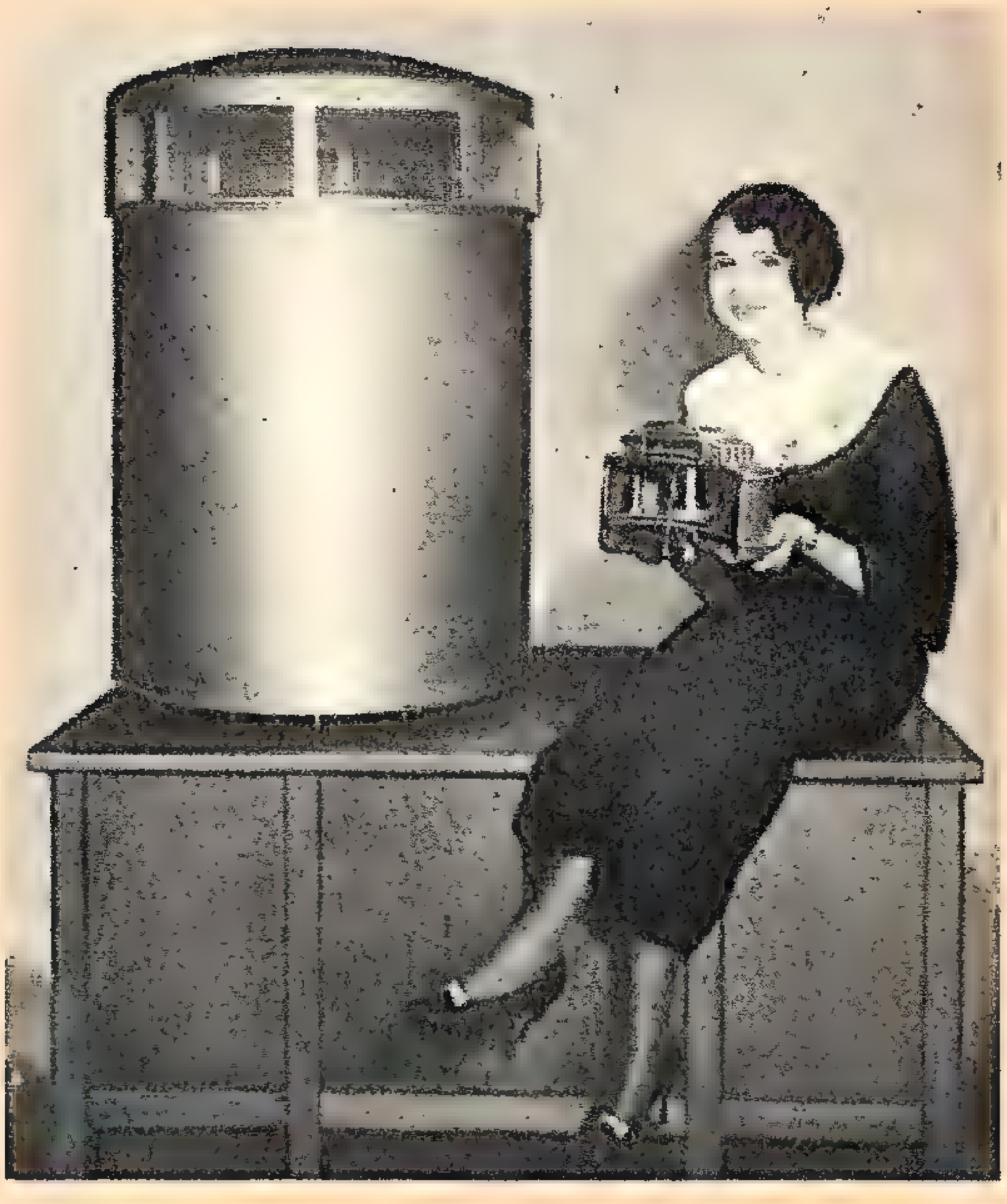
The speedometer is fastened to the head of the steering bar by a bracket and is connected to a special gear on the front hub by a flexible tube containing the driving mechanism. The gear, which fastens on the front spokes, and the speedometer, can be attached easily by any boy.

Air Silencer Tames Diesel Roar

INSPIRED by a tiny air-filter and silencer used in one of the country's popular-priced automobiles, a manufacturer recently built what is believed to be the world's largest intake silencer to tame the ear-splitting thunder of the Diesel engines of the new streamlined railroad trains into a whispering hiss.

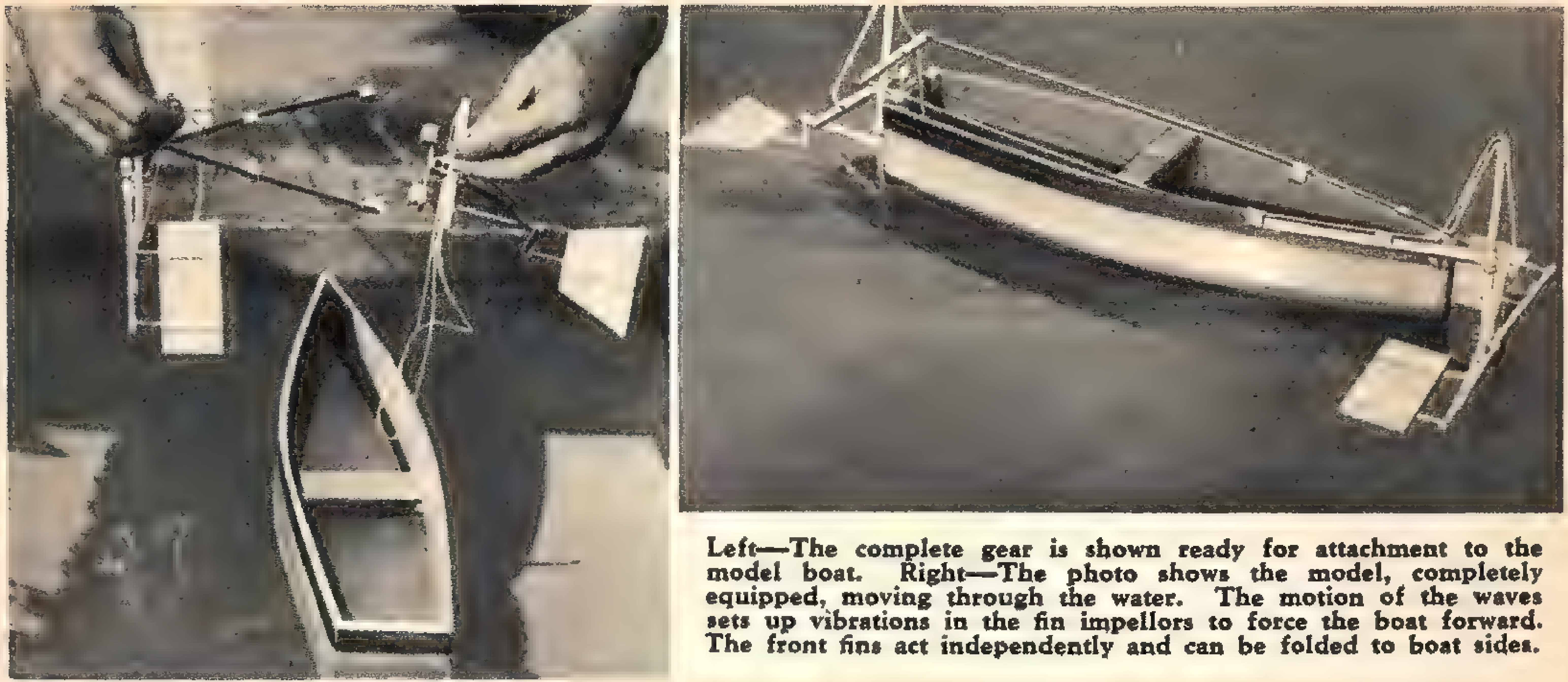
Although Diesels have heretofore used exhaust silencers, the noise of the engine backed up and escaped through the intake manifold. The new silencer is now set into the intake manifold and has baffle-plates arranged to hold back the sound, at the same time allowing air to enter without retardation.

The filter sieves and cloths keep all dust and dirt from getting into the fuel system.



The idea for the huge Diesel air-silencer at the left was inspired by the auto silencer easily held by the woman on the right. It filters and cleans the air entering the motor.

Odd Fins Utilize Up and Down Wave Motion to Propel Boat



Left—The complete gear is shown ready for attachment to the model boat. Right—The photo shows the model, completely equipped, moving through the water. The motion of the waves sets up vibrations in the fin impellors to force the boat forward. The front fins act independently and can be folded to boat sides.

DESIGNED to transfer the up and down motion of the waves into forward energy, a new water craft, designed by a Californian is equipped with a set of light metal fins.

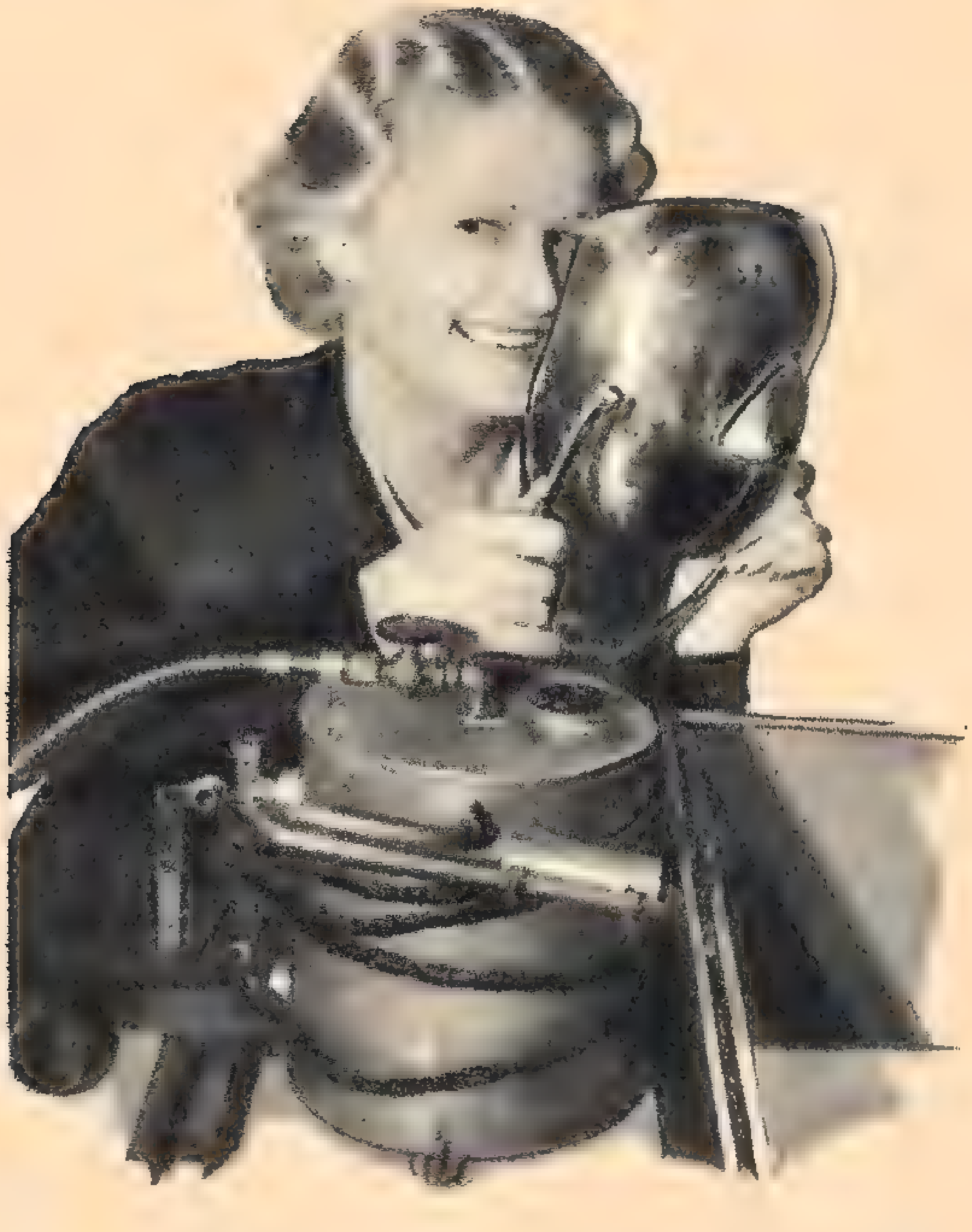
The fins, which in tests have propelled an eighteen-inch model at a speed of five miles per hour, resemble the wings and tail of an airplane. The fore impellors rise and fall with the waves and transfer this energy to a forward propelling fin at the rear of the boat.

Although greater speed is attained when the boat follows the wind direction, it can be steered parallel to or dead against the waves.

Metal Mask Gives Vapor Facials

A METAL face mask, shown at the National Inventors' congress at Hollywood, is used to give steam or medical facials without the use of hot towels.

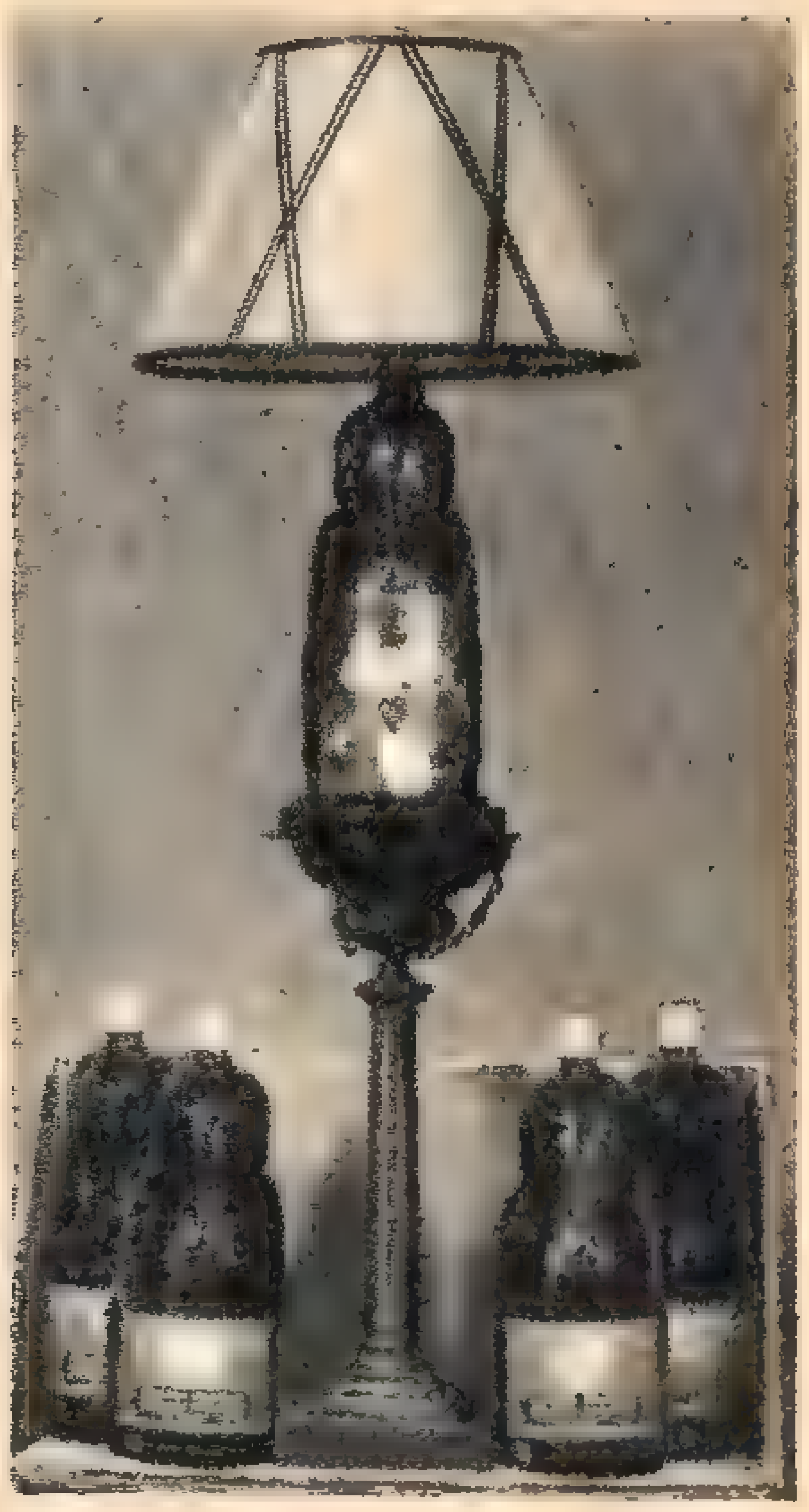
The ingredients used for the facial are first placed in an electrical unit where they are heated to the vapor point. The vapor passes through a tube to the mask where it is emitted through numerous pin-holes in the lining.



The metal mask is moulded to fit the face. Medical ingredients are heated to the vapor point in the electric unit. Vapor passes to the mask to be emitted through pin-holes in lining.

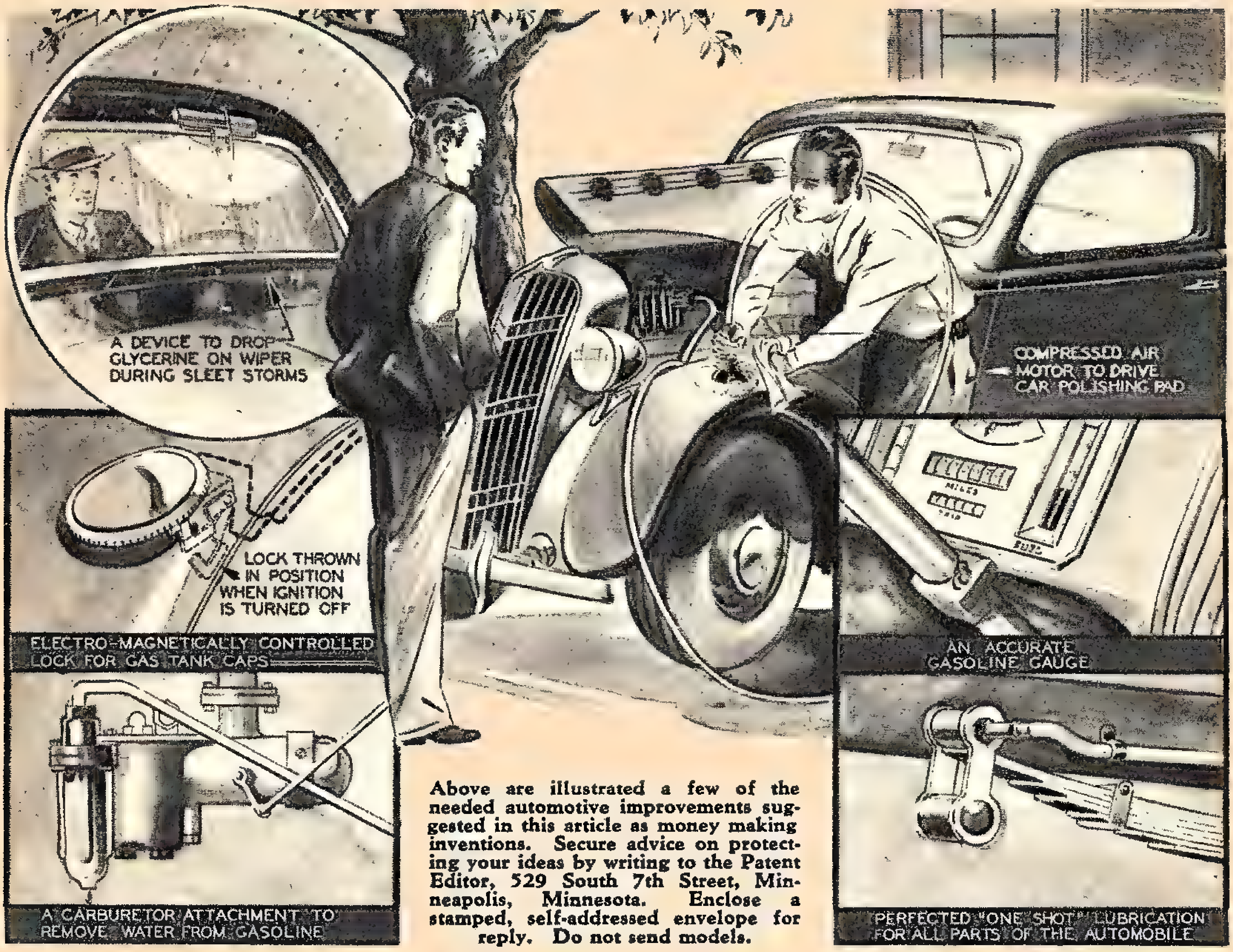
Bottles Make Attractive Lamps

A CORD and socket given with each bottle of a newly manufactured product affords the housewife a chance to make a decorative lamp out of the empty bottle. The socket replaces the bottle cork and supports a light wire frame over which the shade is stretched. Various pictures are furnished to replace labels. The bottles may be used as vases.



A cord and socket are furnished with each bottle. Empty, the bottle makes an attractive lamp base.

LARGE ROYALTIES Offered Inventors For Needed AUTOMOTIVE Improvements


A DEVICE TO DROP GLYCERINE ON WIPER DURING SLEET STORMS
COMPRESSED AIR MOTOR TO DRIVE CAR POLISHING PAD
LOCK THROWN IN POSITION WHEN IGNITION IS TURNED OFF
ELECTRO-MAGNETICALLY CONTROLLED LOCK FOR GAS TANK CAPS
AN ACCURATE GASOLINE GAUGE
A CARBURETOR ATTACHMENT TO REMOVE WATER FROM GASOLINE
PERFECTED "ONE SHOT" LUBRICATION FOR ALL PARTS OF THE AUTOMOBILE

Above are illustrated a few of the needed automotive improvements suggested in this article as money making inventions. Secure advice on protecting your ideas by writing to the Patent Editor, 529 South 7th Street, Minneapolis, Minnesota. Enclose a stamped, self-addressed envelope for reply. Do not send models.

COUNTLESS millions have been earned by smart inventors who have recognized the needs of the American motorist. The Moto-Meter, for instance, made a millionaire of its inventor within a comparatively short time, and the Bendix starter formed the foundation for a $50,000,000 business. Fortunately for those inventors whose minds gravitate toward auto mechanics there is still plenty of opportunity to turn simple ideas into great amounts of cash, for our motor manufacturers are just as eager, just as alert for new ideas as they were twenty years ago, and the man with a new gadget is bound to receive friendly, patient attention.

We now have paint spray guns which fasten in a spark plug hole to operate on cylinder compression. What we need is a high-speed compressed air motor operating from the same source that will drive a polishing pad for waxing the car.

Auto owners are still troubled with gas thieves. An electro-magnetically controlled lock for the caps of gas tanks, which will automatically engage when the ignition of the car is turned off, should be worth $50,000 to the inventor.

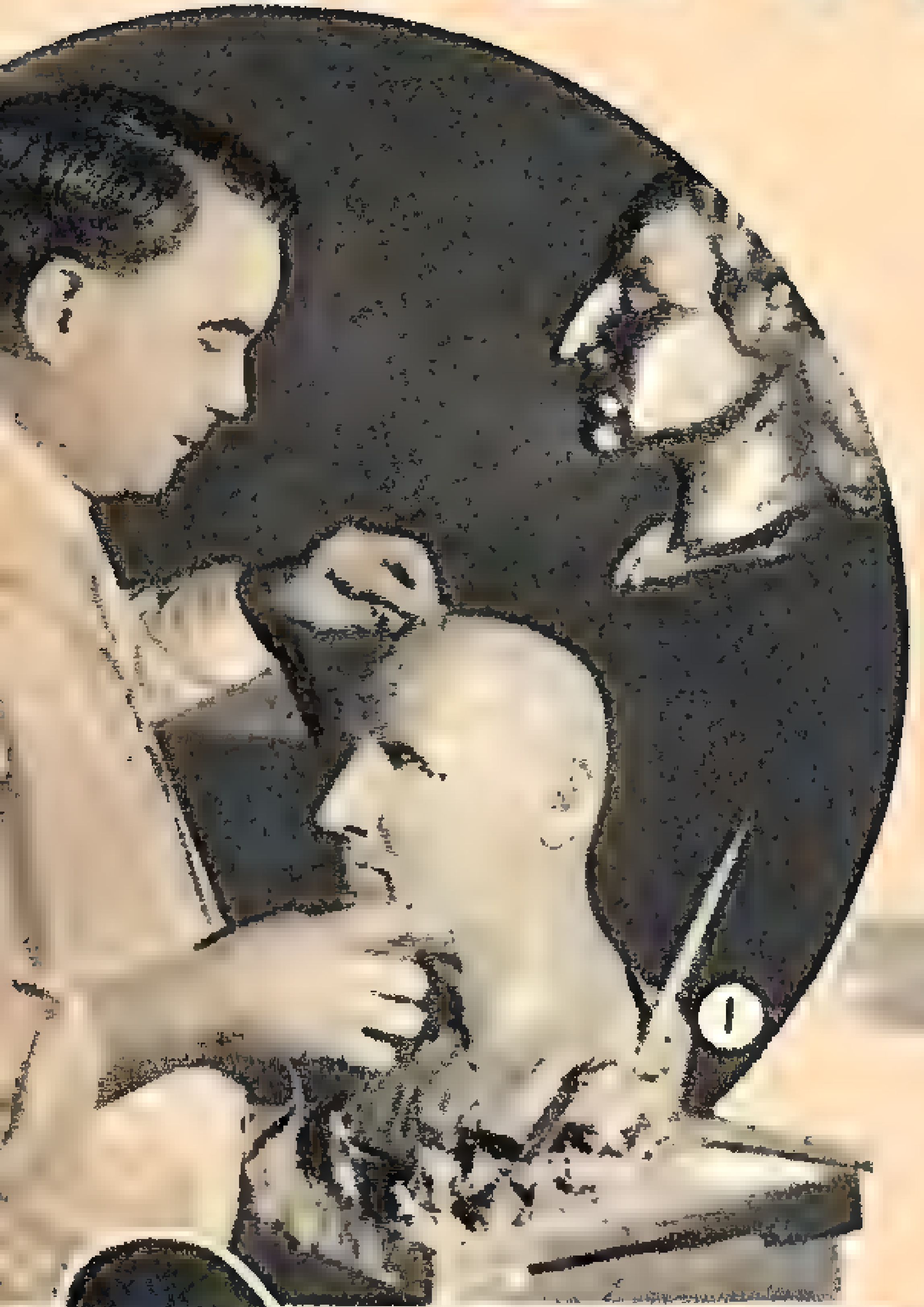
An oil filter for gas engines that would automatically discharge all foreign matter without attention would be worth a good sized fortune.

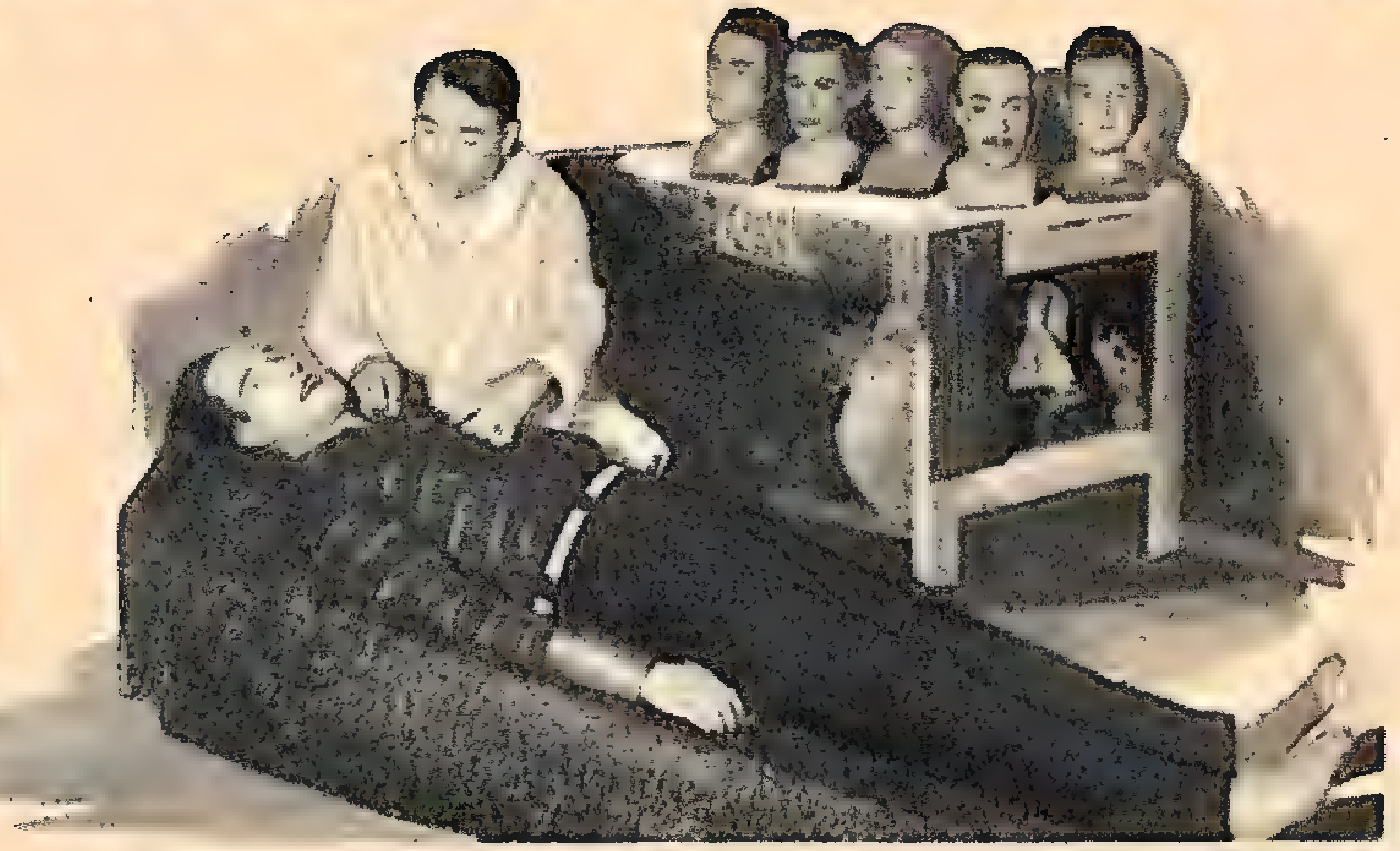
Some years ago an automobile came to the market which featured "One Shot" lubrication. The object of the idea was to supply lubrication to all points of the car by the manipulation of a single handle on the dashboard. The idea was not successful because it was not developed properly, and there is still an urgent demand for such a device.

Automobile ash trays would be much more serviceable if they emptied directly into the atmosphere at the base of the car. They would then never need to be cleaned out. This problem entails merely correct design.

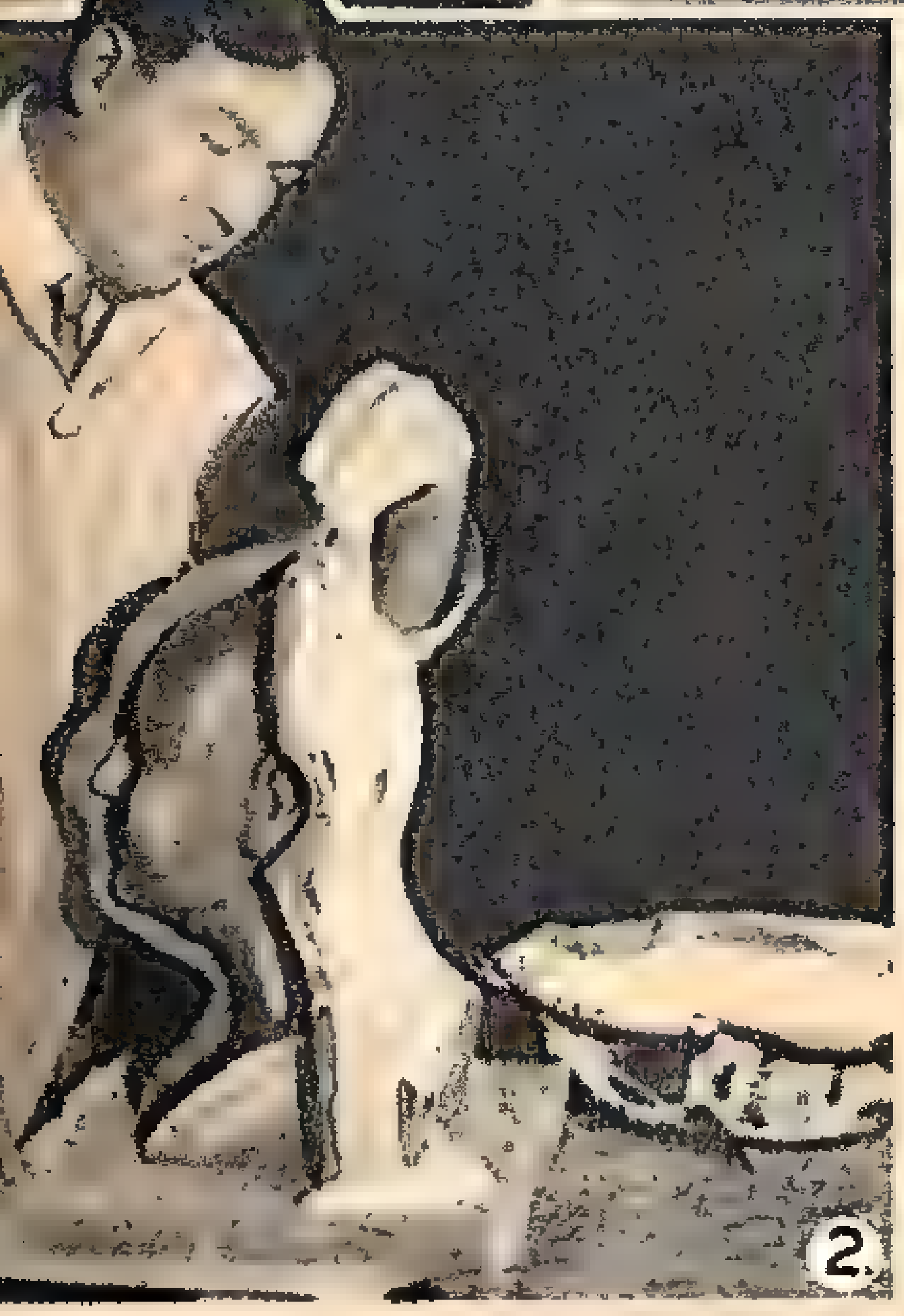
[*Continued on page* 142]

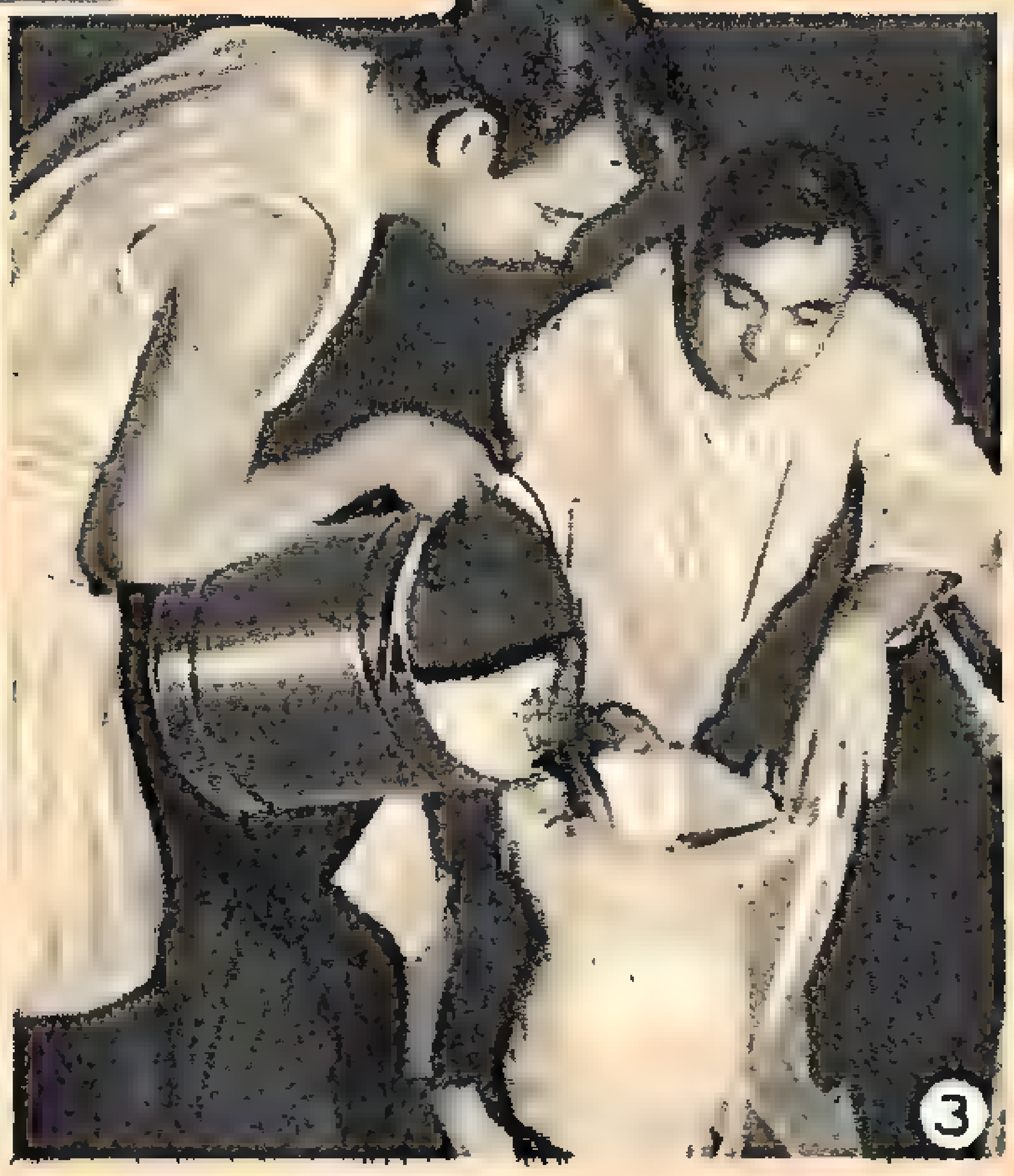
CREATING LIFE LIKE

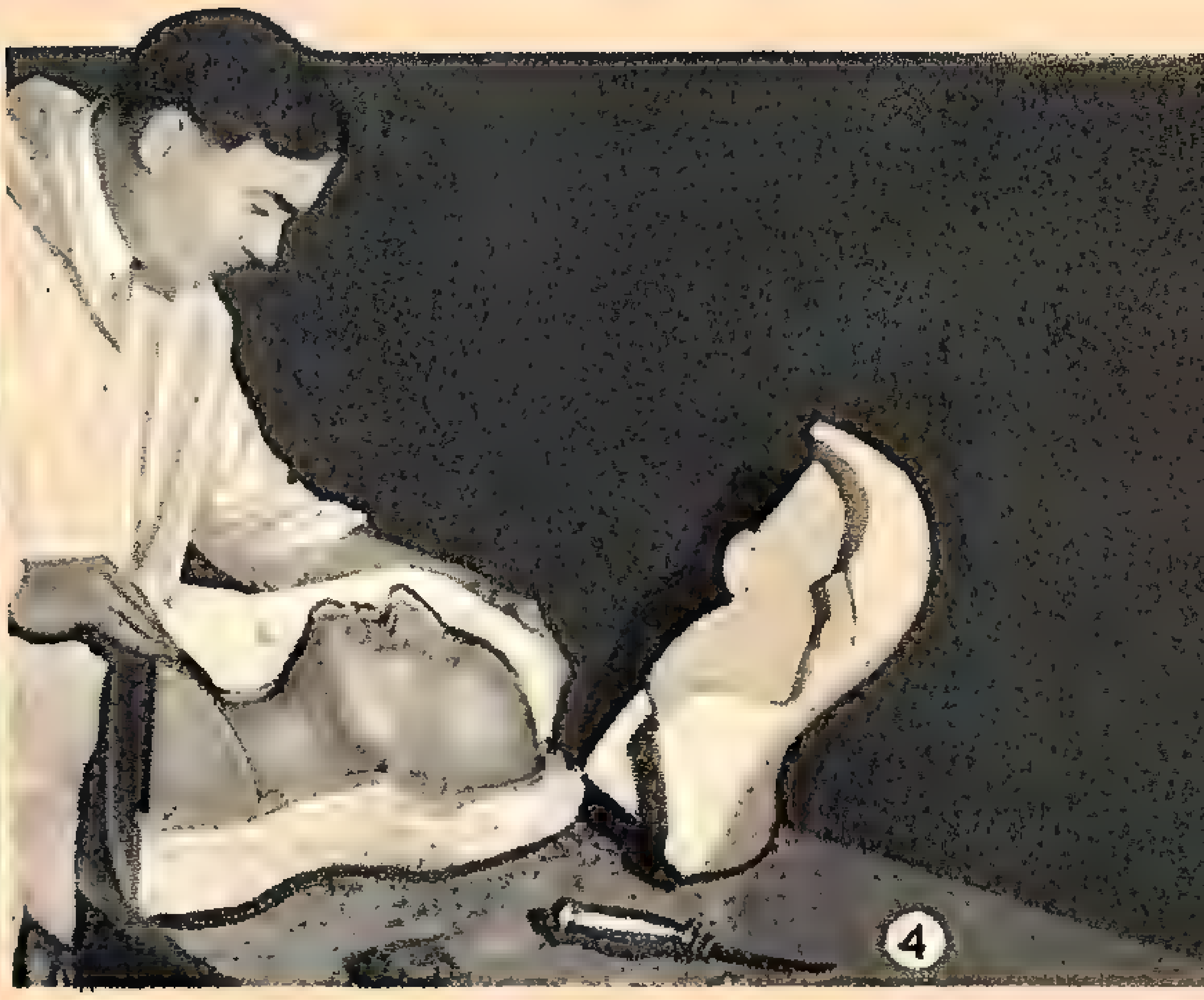




Left—The artist takes the first step on a model of George Washington by molding a clay model. Above—Preparing a notorious western bandit for the "death act." Only exposed parts are wax—clothes cover papier mache body.







Left—The worker building up the back panel of a plaster mold over the first clay model. Center—Pouring the wax into the plaster mold. Right—Breaking the unfinished wax head out of the mold. It is now ready for hair and teeth.

WHERE do the horrors in the wax museums come from? This question may have troubled you as you paused in a side show for a few pleasant shudders. So realistically are they made, so gruesomely exact in every tiny detail, that it would seem the artist must have had the original models pose especially for him.

Let us visit a man in St. Louis who manufactures these macabre specimens in his workshop. It surely will be exciting, and we may learn something in addition.

Arriving at our destination, we opened the door with shivery anticipation—

Instead of the ghostly, dimly-lit laboratory-studio of cobwebs, shadowy corners and bobbling witches' kettles—presided over by some evil-visaged, misshapen gnome, which we expected, we found just the oposite. A stout, jolly man of about forty-five, with a booming, cheery voice, bade us welcome.

"How do I do it?" he laughed. "Come right in. Bill and I are just running off a cast of George Washington!"

We stepped into a well-lighted, well equipped workshop. Bill, a soft-spoken young man of twenty-two nodded a greeting.

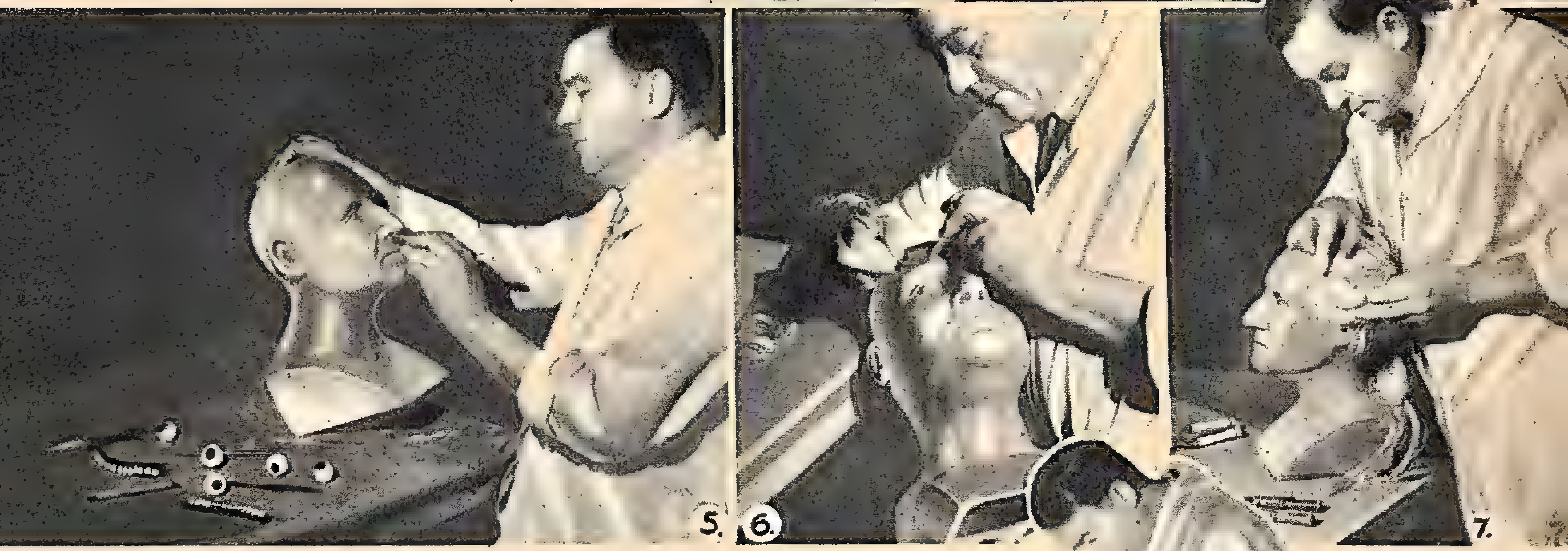
Mr. Christophel walked over to a well executed head of George Washington, sculptured in modeling clay. "This is the first step in making wax figures," he stated. "I'm just putting the finishing touches to it now. Next—" he reached for a bottle of oil. "I

Figures For WAX MUSEUMS

by HAROLD L. ZIMMER

Washington, Roosevelt, Billy the Kid, Jesse James! All the world's most colorful figures stand out with startling reality in a wax museum. This article tells how workers transfer a simple photograph into amazingly life like figures sculptured in tinted wax.

Right—The author, Harold Zimmer standing between wax models of "Wild Bill" Hickock at left and the famous fighter, Billy the Kid.



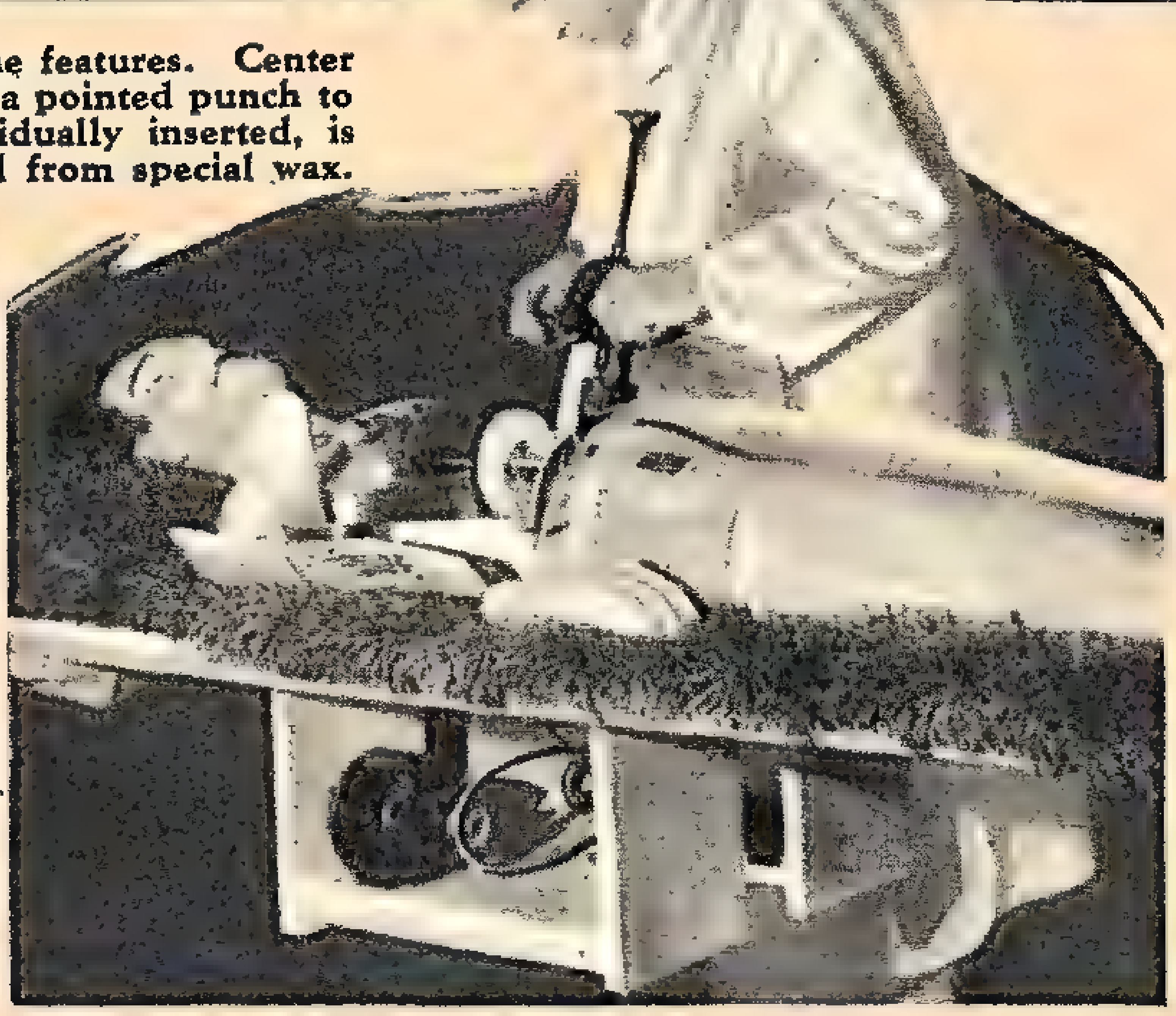
Left—Inserting the teeth and applying the finishing touches on the features. Center—Setting the eyelashes. Each hair is driven into the model with a pointed punch to gain natural appearance. Right—Human hair, each one individually inserted, is used to complete the model head of George Washington molded from special wax.

grease the clay head thoroughly, to keep it from sticking to the plaster.

"People often wonder why the figures are so true to life. This is a compliment to the sculptor, for he seldom sees the original model—most of them being dead—and must go either by old pictures found in books or—as is sometimes the case—from a newspaper clipping. Figures of modern notorious characters and celebrities are often found in this way.

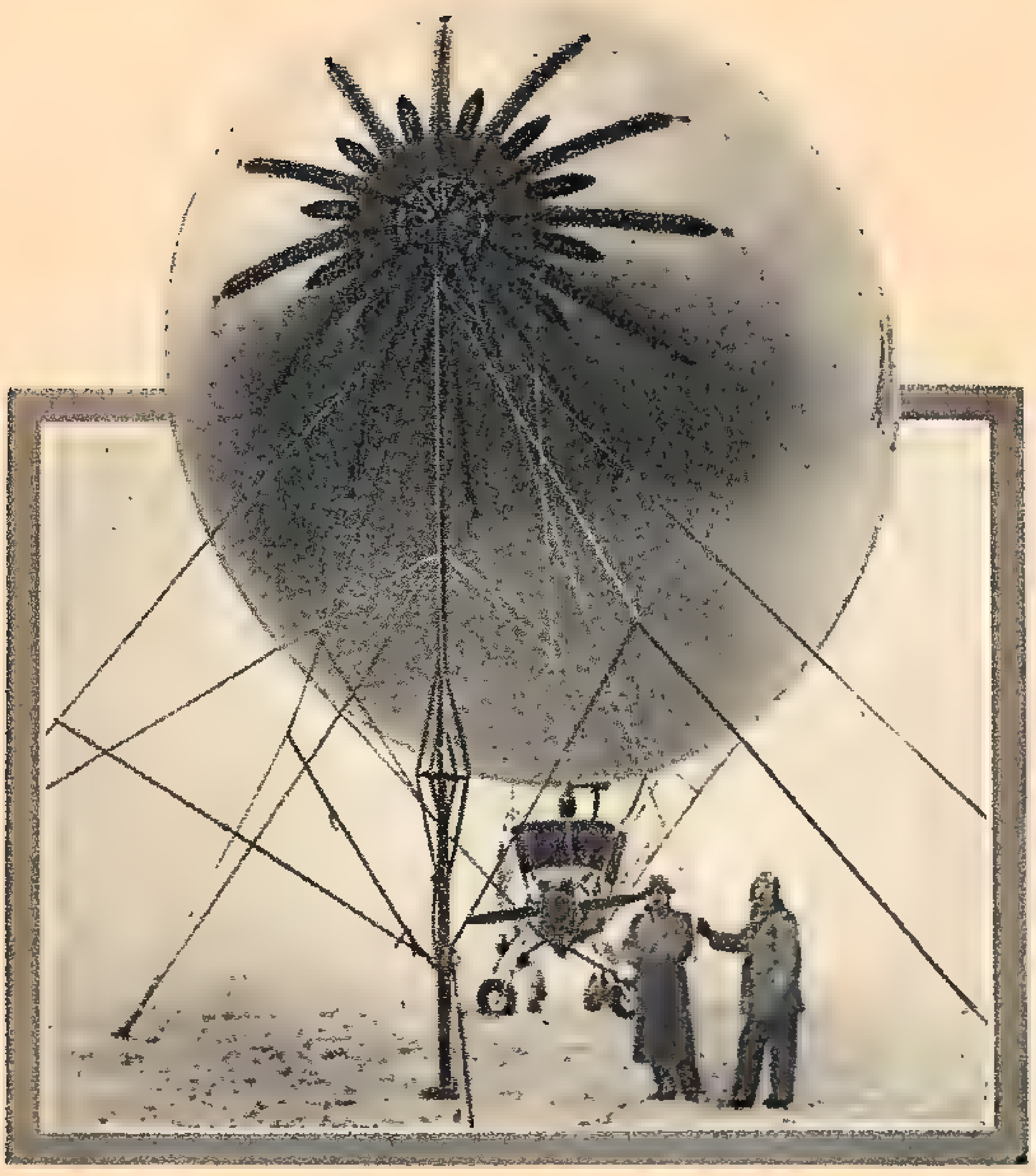
"A wax worker's art is not always gruesome," Chris continued, taking the finished clay model over to where Bill was

[Continued on page 122]



The breathing mechanism exposed. A silent electric motor runs a reduction gear which is timed to conform with regular breathing. The machine can be regulated to produce the breath of a sleeping beauty or the gasps of a dying bandit.

Collapsible Masts Eliminate Dirigible Mooring Problems



Heinen's dirigible is shown moored to his portable mast at Washington, D. C. Note the guy wires supporting stub mast.

LIGHT dirigibles receive a new practical value through the invention of a portable mooring mast, by Anton Heinen of Lakewood, N. J., which will permit dirigibles to land on any suitable field and remain there any desired length of time.

The mast consists of several lengths of pipes fitted one into another so that they may be compressed to fill a small space in the passenger car when not in use.

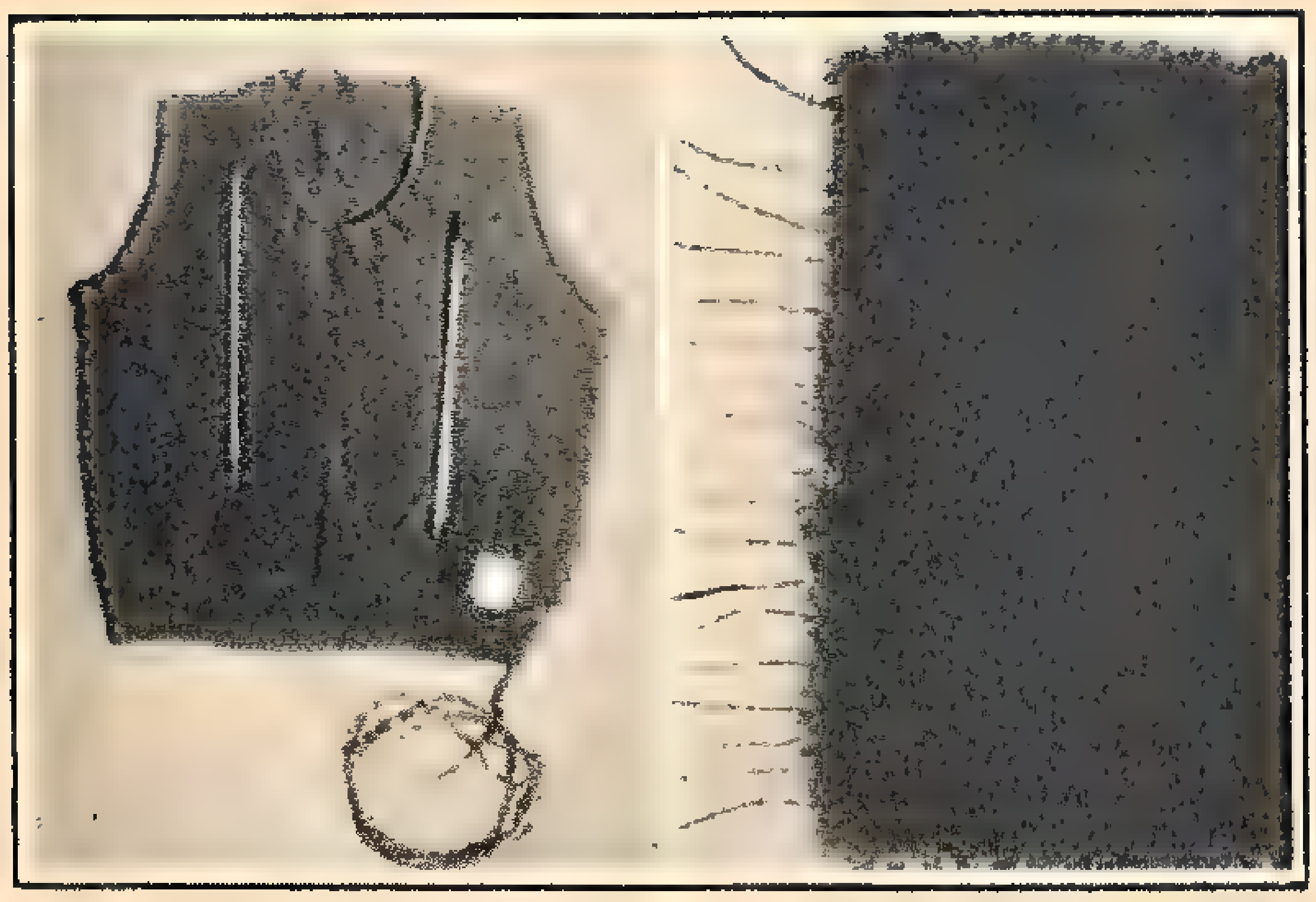
To moor the dirigible when it is brought to earth, the mast is extended and set into a hole in the ground. The joints are held rigid by braces and the whole mast is set firmly in place by a system of guy-wires attached to stakes driven in the ground.

Since a dirigible will not crash when the motor stops, this mast may make it possible for explorers to use this craft on their trips.

Invisible Wires Heat Garments

LIGHT sweaters can attain and surpass the warmth of the Eskimo's fur jacket through the use of a revolutionary new weaving process that incorporates fine copper or steel threads, five-thousanths of an inch in diameter, into the regular weave to heat the garment when plugged into a convenient electric outlet.

The wires are covered with a special insulation that adds life and service to the garment. Woven into airplane fabric the wires will be invaluable in keeping ice from forming on the wings.



Left—A sweater into which is woven thousands of tiny wire heating threads. Right—Rugs may also be heated by this method to aid in heating the house during the winter.

Tiny Model Sloop Sails 25 Miles

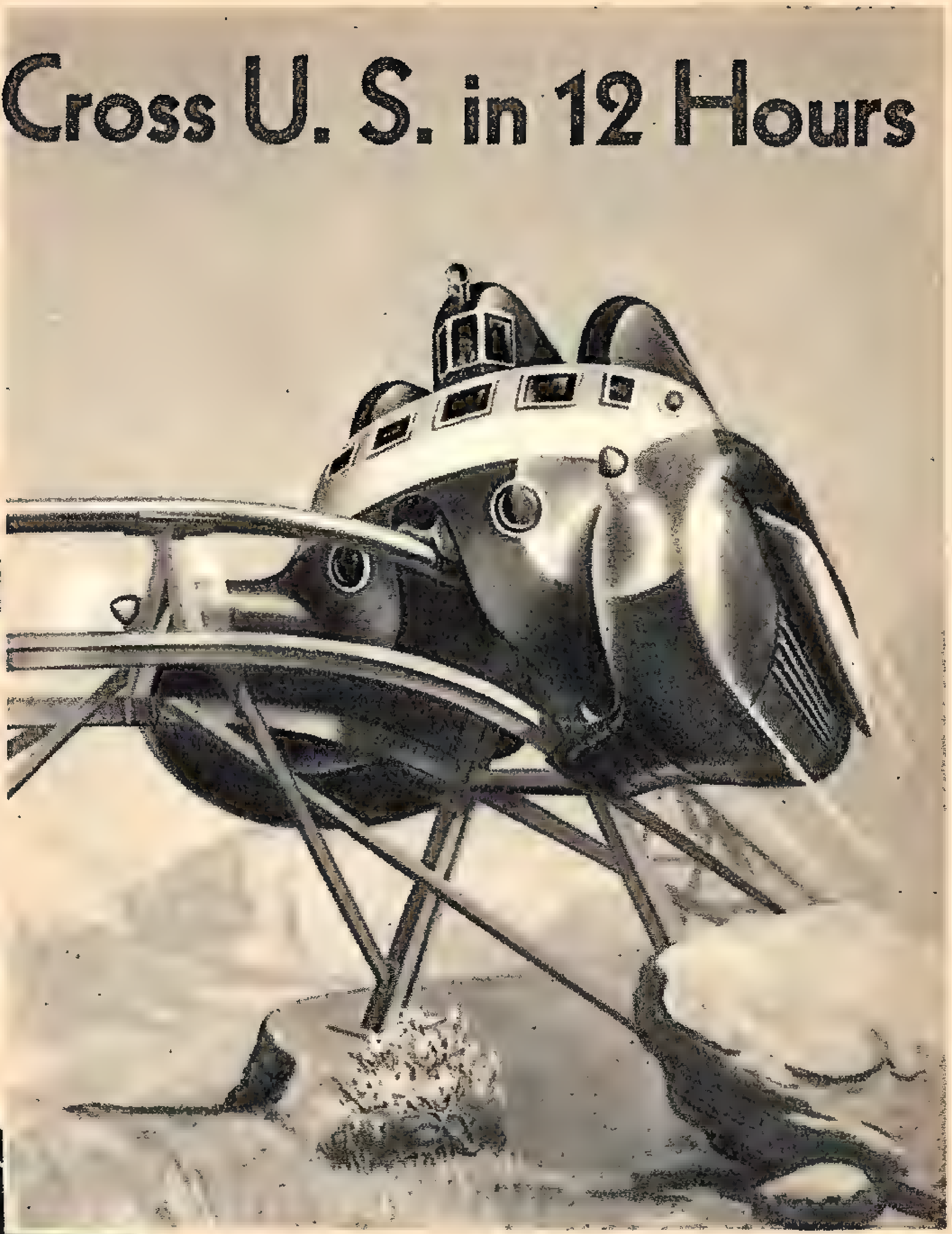
H. Ormsby Phillips is shown here with his record-making model sloop. The bottom of the boat was attacked by fish.

ACROSS a twenty-five mile stretch of open ocean, between Newport Beach, Calif., and Catilina Island in twelve hours and 35 minutes is the record recently set by the trim little model sloop owned by Ormsby Phillips, Commodore of the Los Angeles Model Yacht Club.

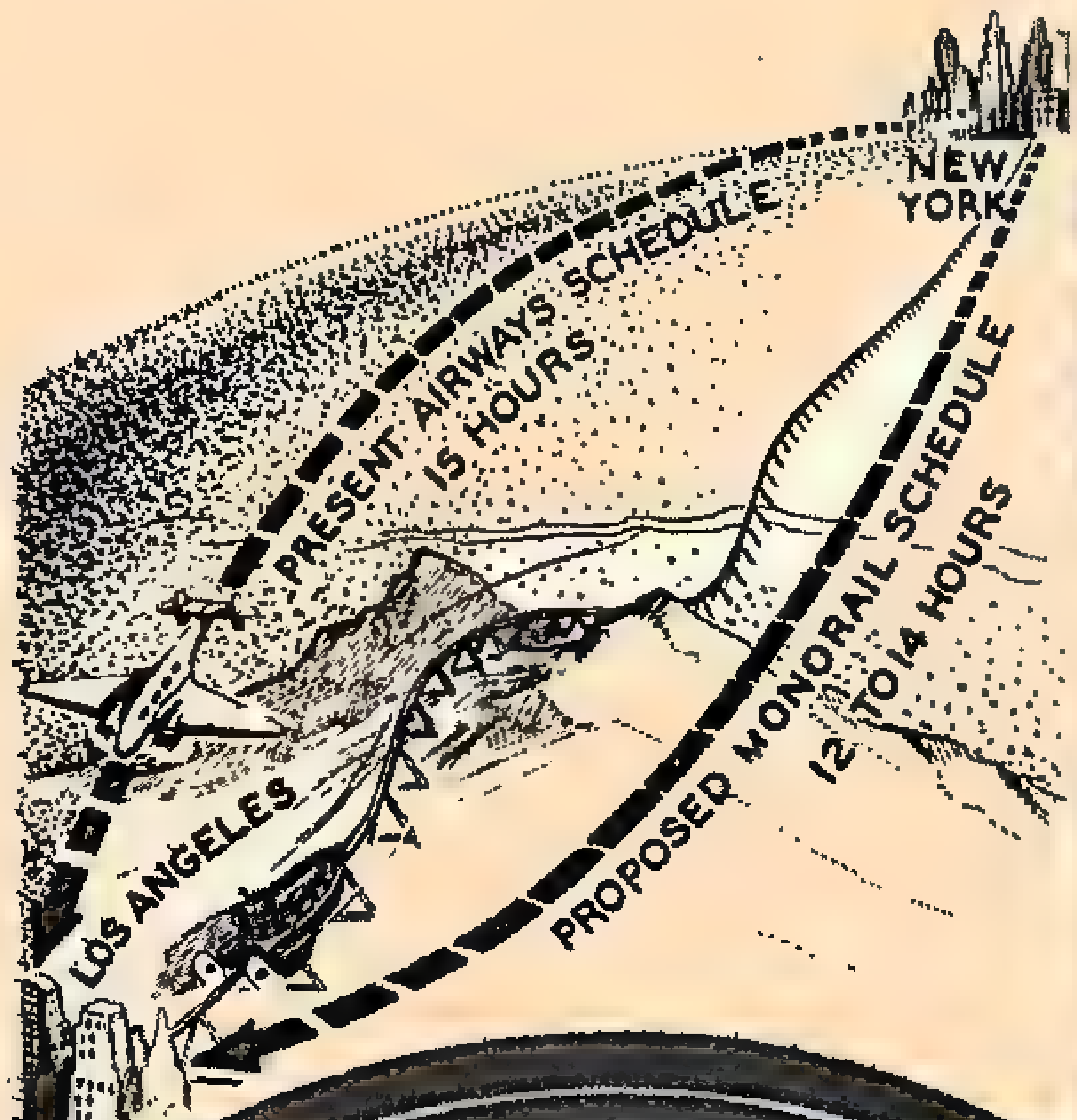
Inspired by the run, the club is organizing a deep sea race for models over the same course. The contest is attracting a nationwide interest among model yacht owners, some of whom have built models which in some cases exceed a cost of $1,000.

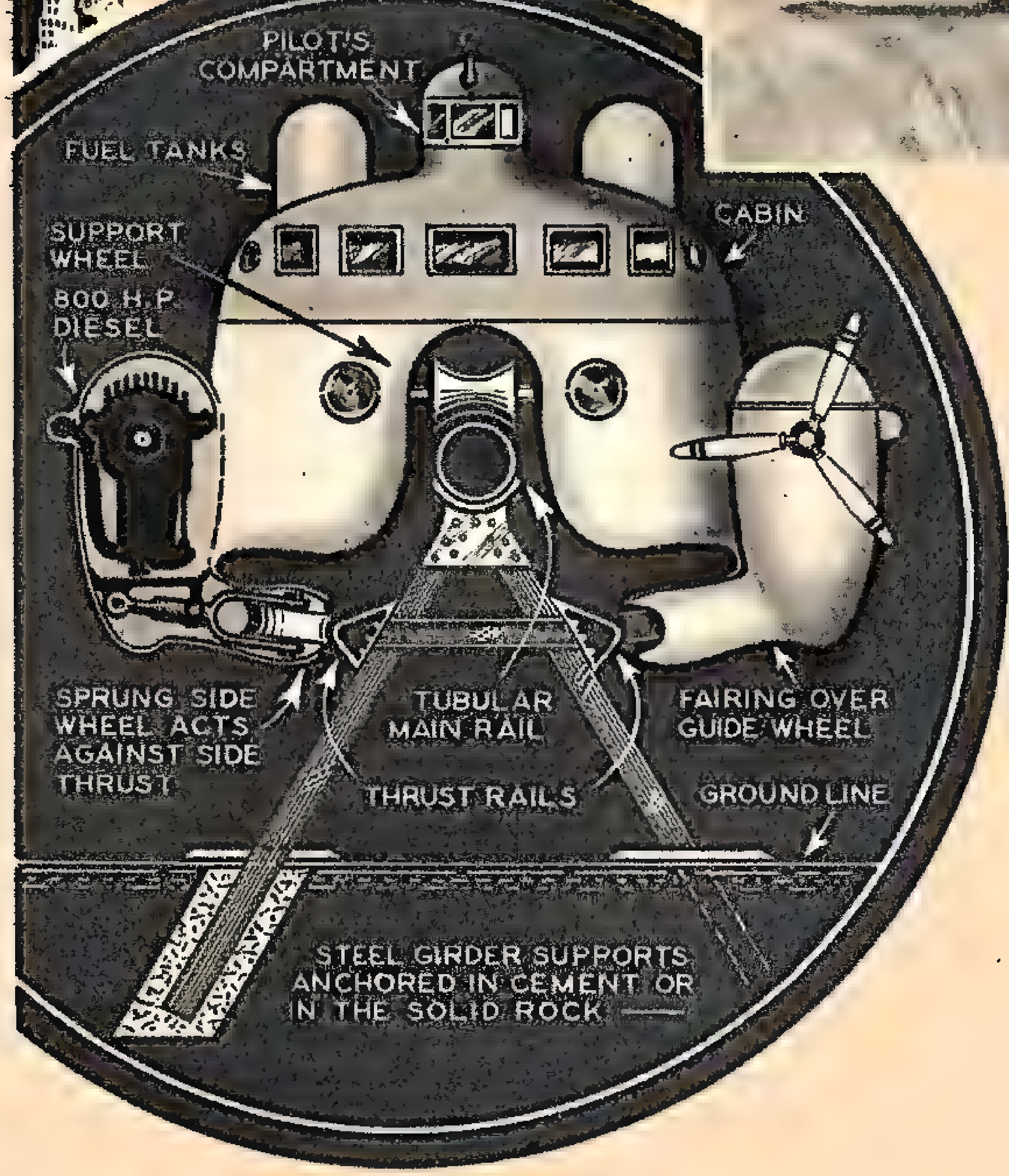
Aero-Car to Cross U. S. in 12 Hours

Delicately balanced on a single rail, the proposed Aero-Drive Monorail Express, described in this article, will speed across the continent at a rate in excess of 250 miles per hour.



Above—The aero-drive, monorail express car speeding through the mountains. Powered by twin Diesel engines which drive triple bladed air screws, the car will travel at great speed without being hampered by lack of visibility and bad weather, the present great aviation hazards.


NEW YORK
PRESENT AIRWAYS SCHEDULE 15 HOURS
PROPOSED MONORAIL SCHEDULE 12 TO 14 HOURS
LOS ANGELES


PILOT'S COMPARTMENT
FUEL TANKS
CABIN
SUPPORT WHEEL
800 H.P. DIESEL
SPRUNG SIDE WHEEL ACTS AGAINST SIDE THRUST
TUBULAR MAIN RAIL
FAIRING OVER GUIDE WHEEL
THRUST RAILS
GROUND LINE
STEEL GIRDER SUPPORTS ANCHORED IN CEMENT OR IN THE SOLID ROCK

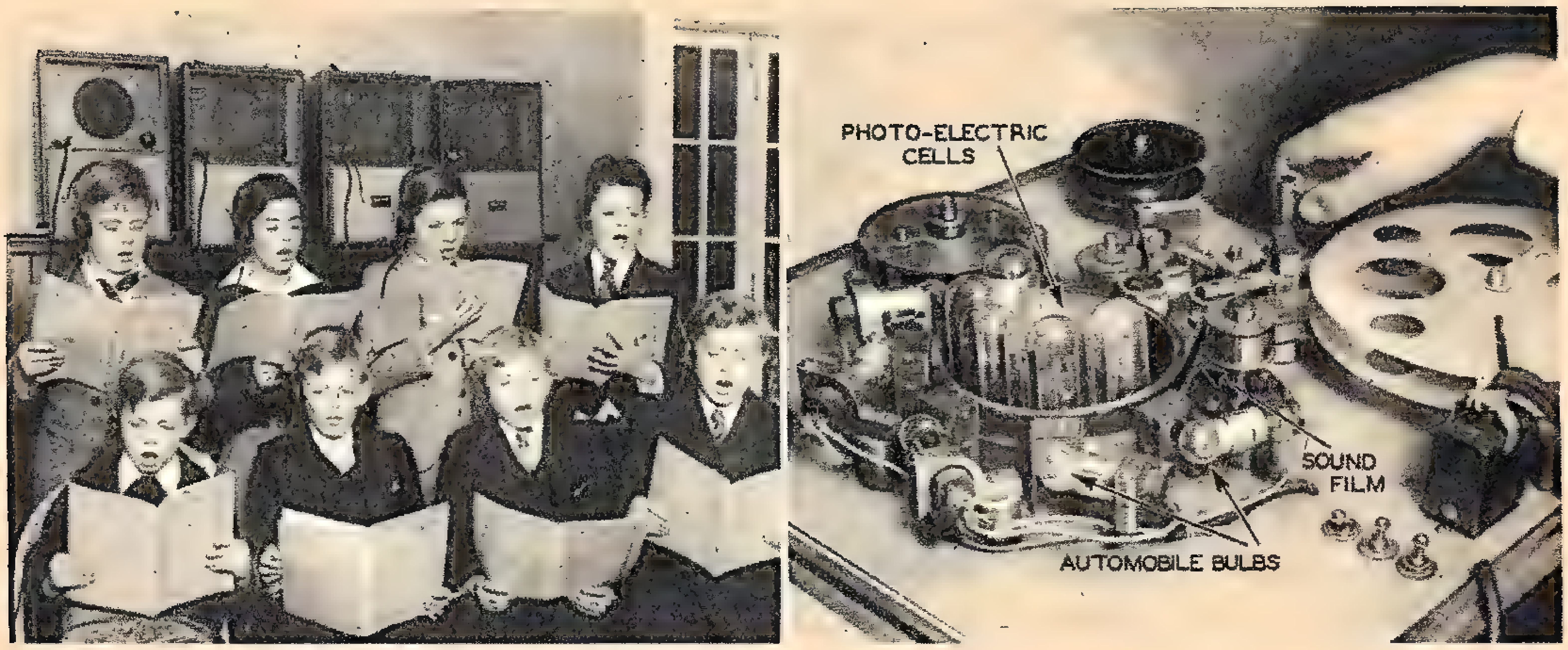
At top—The monorail express, unhampered by weather, could travel faster than modern planes. In circle—A cross-section of the passenger car. The guide wheels are mounted on shock-absorbing carriages which absorb all tendency of the car to sway from side-to-side. The main wheels are set in the middle of the car, and support it in perfect suspension on the single tubular rail. The rail is carried across the country on triangular steel girders sunk either into cement foundations or solid rock.

HURTLING across the country at a 250 mile per hour clip through fog and heavy weather with perfect safety may become a common experience if plans for a giant aero-drive monorail express are carried out. The designer believes his monorail express could cross the U. S. in 12 to 14 hours, as compared to the 15-hour trip of present-day transcontinental air service.

Built to cut the atmosphere at a high rate of speed, the cars are streamlined and ride a single tubular rail on deeply flanged pulley-like wheels. Guide wheels, mounted in shock absorbing carriages, follow supplementary tracks, automatically taking up all lateral swaying of the speeding car as it swings around the highly banked curves.

The main and secondary tracks are supported by triangular steel girders which can be easily and quickly set in any type of country.

Electric Eye Trains Voices For Chorus

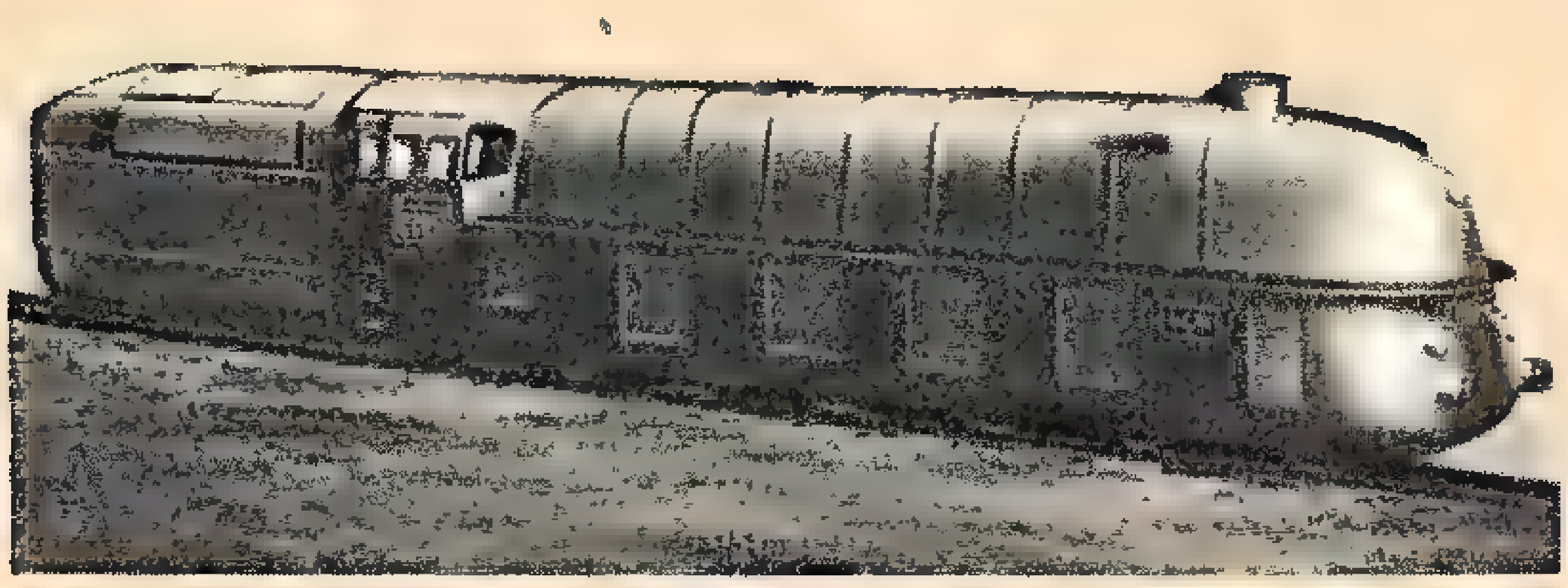


Left—Members of the Newark Electro-Choir learning a new song with the aid of headphones which bring a distinct melody as guidance to the singer. Right—A view of the photo-electric transmitter. Note film passing between lens and electric eye.

AMAZING, almost human at its astounding task, is the photo-electric device invented by Captain Richard H. Ranger which breaks a melody into its component parts, soprano, alto, tenor, bass, and transmits them separately to facilitate the quick training of singers.

The invention is composed of a sound film with five different sound tracks which is passed around a drum before five different photo-electric cells. In front of each photo-electric cell is a small auto bulb and a lens. The lens focuses the light of the bulb onto the film, and the rays are then picked up by the cell on the other side which transmits the sound.

Each bulb, lens, and photo-electric cell unit handles one of the sound tracks. Four of the tracks transmit the soprano, alto, tenor, and bass; the other transmits the melody as a whole. The singers receive their individual tone through a headphone while listening to the whole melody through a loud speaker. Thus, while practicing, each group can be kept in a separate room, hearing the melody only in its perfect form.



A view of the new German engine as it will look when it is completed. Note the smooth "bullet" type lines. The vents in the cover side prevent overheating of moving engine parts.

Rim Prevents Blow-Out Accidents

This inner-rim, designed to prevent blow-out accidents, is rigidly fastened inside of wheel itself.

DESIGNED to eliminate the hazards of a blow-out, a new inner-rim, offset to half the size of an inflated tire, is firmly attached to the wheel itself. When a blow-out occurs, the automobile drops to ride on the tire guard which is said to maintain a level course without swerving. The device not only lessens the fear of severe accident, but it also prevents rim cuts on punctured tires while stopping the auto.

German Engine Uses "Bullet" Lines

GERMAN locomotive engineers in following the streamline trend have originated a design for steam engines that is uniquely their own—following the lines of the high-speed, soft-nosed bullet.

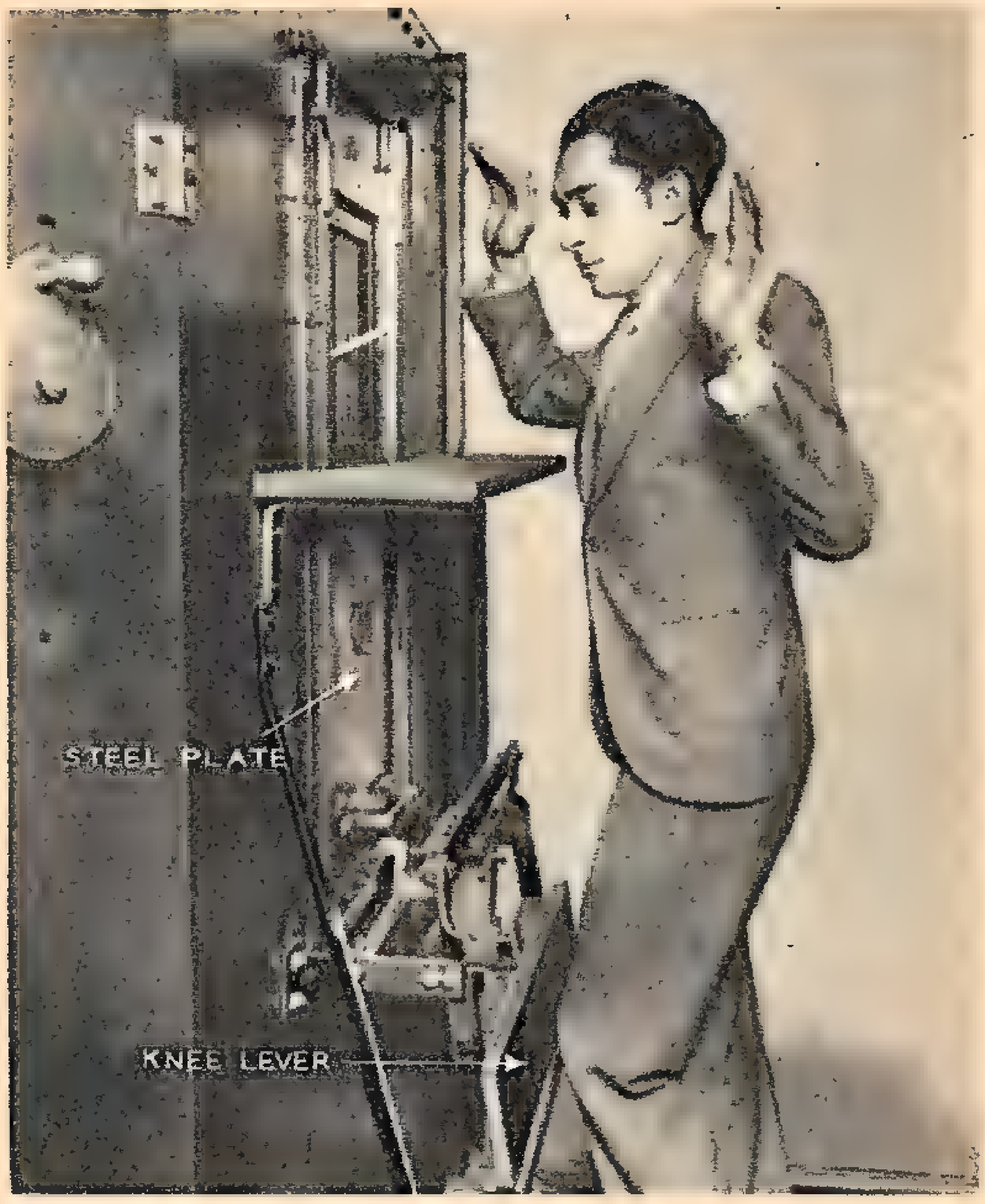
The engines, now under construction for the German Railway Company at the Borsig Works, are completely encased in a smooth metal cover, leaving only vented openings to prevent the overheating of the drive wheels.

Steel Plate Flashes Over Window To Guard Holdup Victims

THE leveled gun and the sharp cry of "Stick 'em up" need no longer strike terror to the hearts of bank tellers since the invention of a new holdup guard which, when released by the pressure of the knee, flashes a heavy steel plate between the robber and his victim.

This new guard features a heavy steel plate, set above compressed steel springs and fitting into grooves behind the teller's window. The springs are held in compression by a trigger fastened to a release bar near the teller's knee. Slight pressure of the knee trips the trigger and flashes the steel plate before the window in a split second.

This guard is more practical than the conventional alarm as it can be sprung without tell-tale movement, and it affords complete protection from baffled burglars left with nothing but a bullet-proof wall as a target.



A mere pressure of the knee releases a trigger and sends a bullet-proof steel plate between the holdup man and his victim.

Actor Plays Underwater Symphony

Jack Holt, screen star, shown playing a piano in an underwater scene. A microphone hidden in the seaweed recorded the sound, a faint tinkle slightly resembling music.

CLAD in a heavy diving suit, Jack Holt, screen star, gave vent to his musical emotions by playing a piano on an underwater movie set.

This strange stunt was a feature called for in a recent movie and was recorded by a microphone hidden in the seaweed which hung over the instrument.

The scene, illumined by unusual underwater lights was quite effective, but the microphone picked up only faint tinkles remotely resembling music.

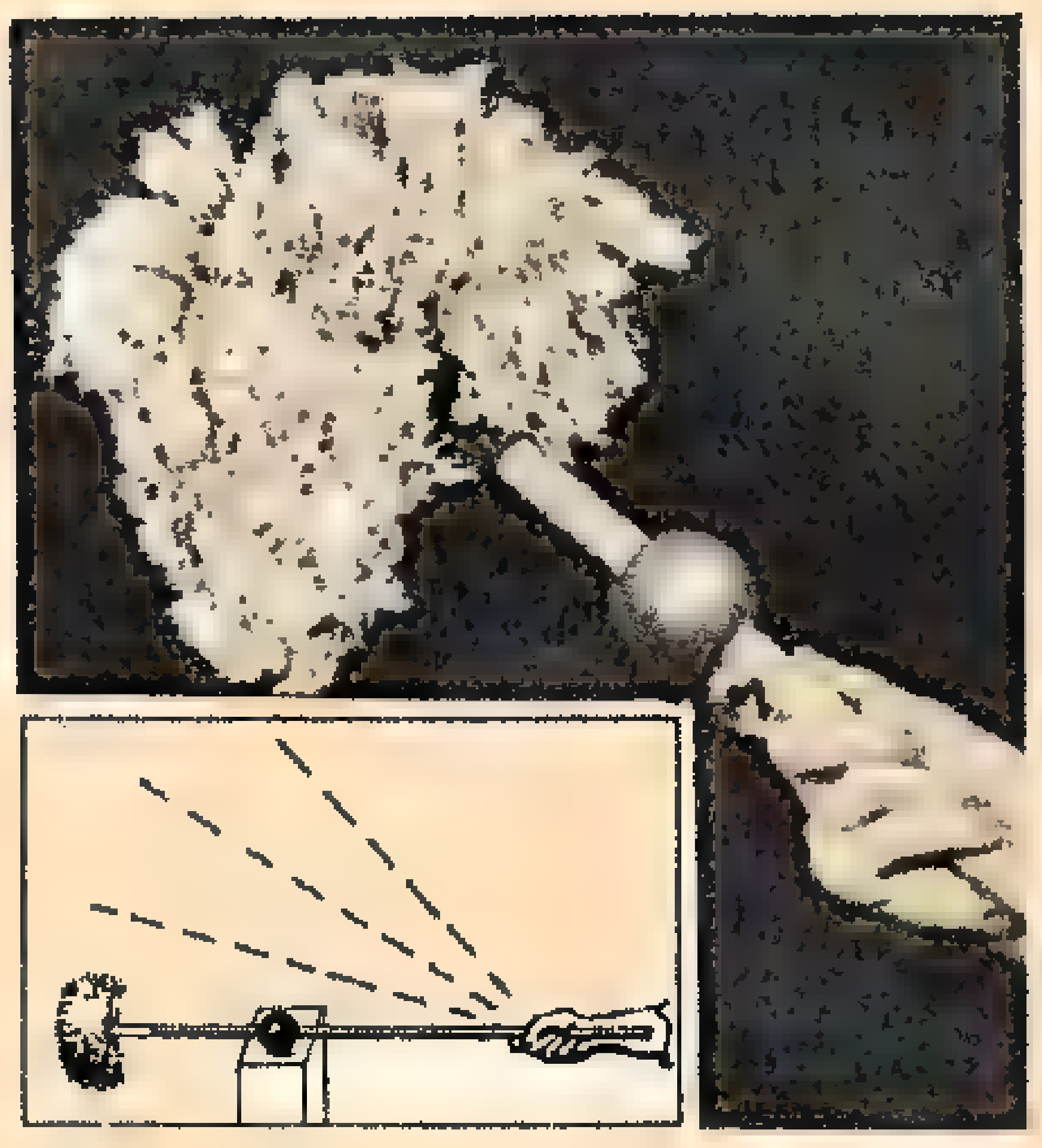
Machine Takes Casein from Milk

A MACHINE which extracts the casein from cow's milk has eliminated hand work from the making of glossy finish for papers, taking the milk in at one end and turning out the completely separated casein from the other.

The machine insures the uniformity demanded in the printing of modern advertising. It washes the curds free of foreign substances and presses them into cakes. The cakes are held in storage until needed.

Balls Aids In Cleaning Dust Mop

WHEN the rubber ball, set in the handle of a dust mop, is struck over a window ledge, it sets up a strong vibration which shakes the dust from the mop. The ball does not damage the surface on which it is bounced.



The rubber ball, when struck over a projecting ledge, sets up vibrations to shake the mop head.

Professor Stays Home; Conducts Class With Two-Way Radio

Left—Dr. C. C. Clark lecturing by two-way radio to his science class (right) meeting in another building.

UTILIZING "micro-waves," Marconi's latest discovery in the radio field, Dr. C. C. Clark can lecture to his General Science class a quarter of a mile away without leaving the quiet comfort of his own home.

A receiver in the class-room is tuned to the professor's lecture, and questions are answered directly as they are relayed over the two-way transmission by the professor's assistant. Such a device will permit instructor to carry on his lectures even while sick and confined to his home.

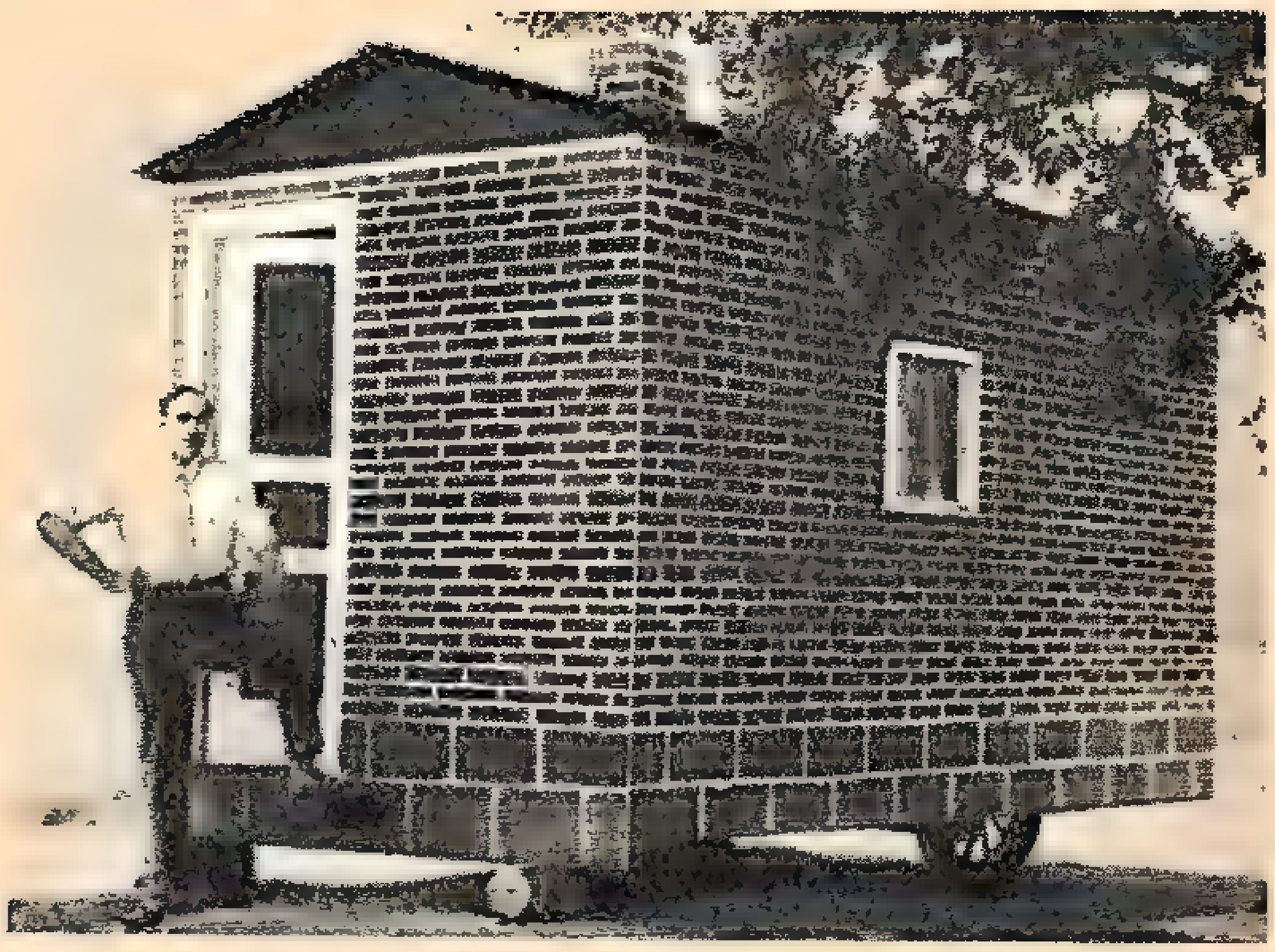
Rubber Telephone Cord Stretches

A BAND of gum rubber, woven between the wires in the center of a telephone cord, gives it an elasticity which permits a stretch of four feet on a cord originally only one foot long.

Small wires are packed into the rubber center like a spring to coil when released. Said to be equally as durable as the conventional cloth wrapped cords, the new type can be extended to four times its original length.

The rubber of the new telephone cord is interwoven with coiled springs which allow the user to stretch the cord four times its original length without any resultant damages.

Student Makes Home In Trailer



G. Albert Spencer is shown standing before his traveling home which is constructed from lumber that he finished himself.

G. ALBERT SPENCER, a student at the University of Utah, lives in high style at low cost in his home-like trailer which he built for himself for use while traveling between Paris, Idaho, and Salt Lake City, Utah.

The trailer is 12 feet long and 6½ feet wide. It contains two chairs, a table, a typewriter stand, stove, hat-rack, a clothes closet, and many other home conveniences. It is constructed from lumber which Spencer cut for himself, and it is painted to resemble brick construction.

First Class Mail To Go By Air

A VAST plan for carrying air mail was started in England recently with the announcement by Sir Phillip Sassoon that all first class mail will be sent by air. First class air service to India, Australia, South Africa and Singapore will begin at once.

RADIO
SPARKS

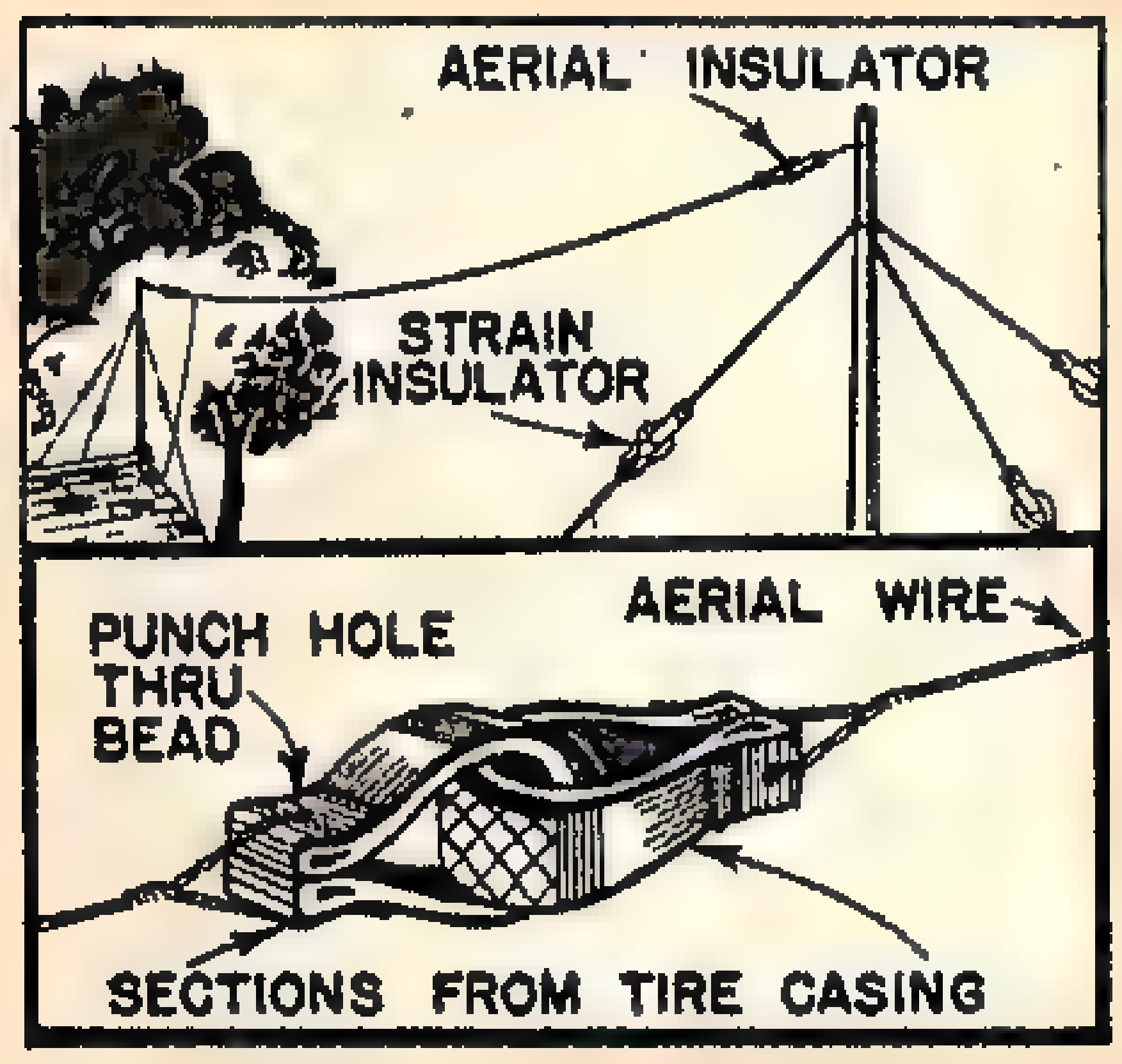
Connect Distant Speaker To Radio Set With Only One Wire

IF AN additional loudspeaker is desired in the studio, playhouse, or barn, a single wire between the two points is sufficient, provided magnetic speakers are used. The ground itself serves as the return wire.

Locate the loudspeaker post which is connected to the plate circuit of the output tube of your set. Run your single wire from this post out of the house to the other speaker using insulators where necessary. A switch should be placed in series with this wire at the remote location, to enable this speaker to be shut off even though the radio in the house is being used. Ground the other terminal of this speaker.

The radio set itself must have a good ground. Place a 2 mfd. condenser in series with the single wire at the radio set, to prevent short circuits. Do not try this with sets having a dynamic speaker.

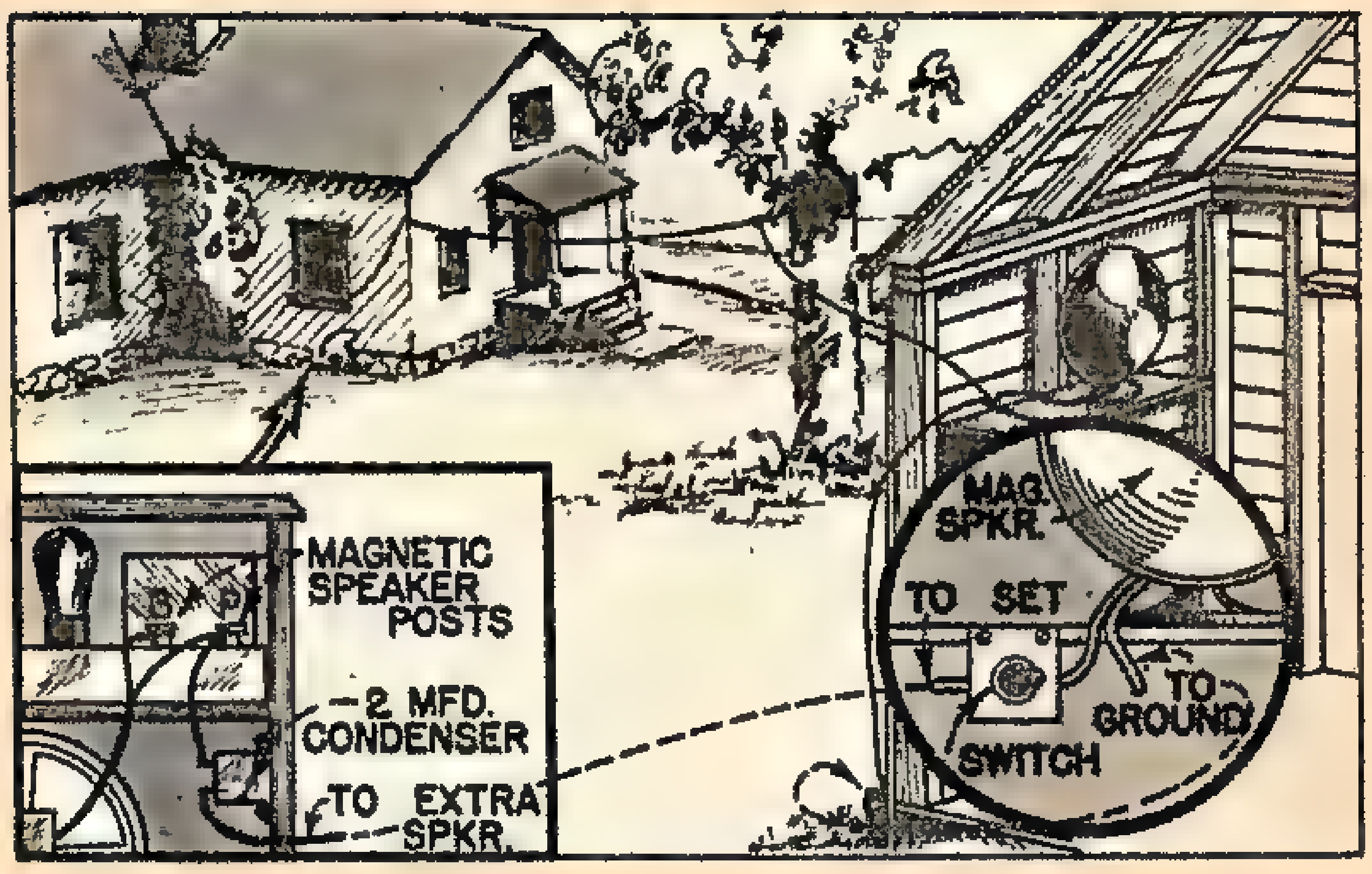
Make Insulators from Old Tires


AERIAL INSULATOR
STRAIN INSULATOR
PUNCH HOLE THRU BEAD
AERIAL WIRE
SECTIONS FROM TIRE CASING

Make serviceable, no-cost insulators from auto tires as shown here.

STRONG and dependable insulators for aerial wires and mast guy wires are readily made from an old auto tire casing. Cut slices about one inch wide from the casing, and punch holes in each just inside the bead. Two of these slices are looped together as shown in the sketch, and the wires then run through the holes.

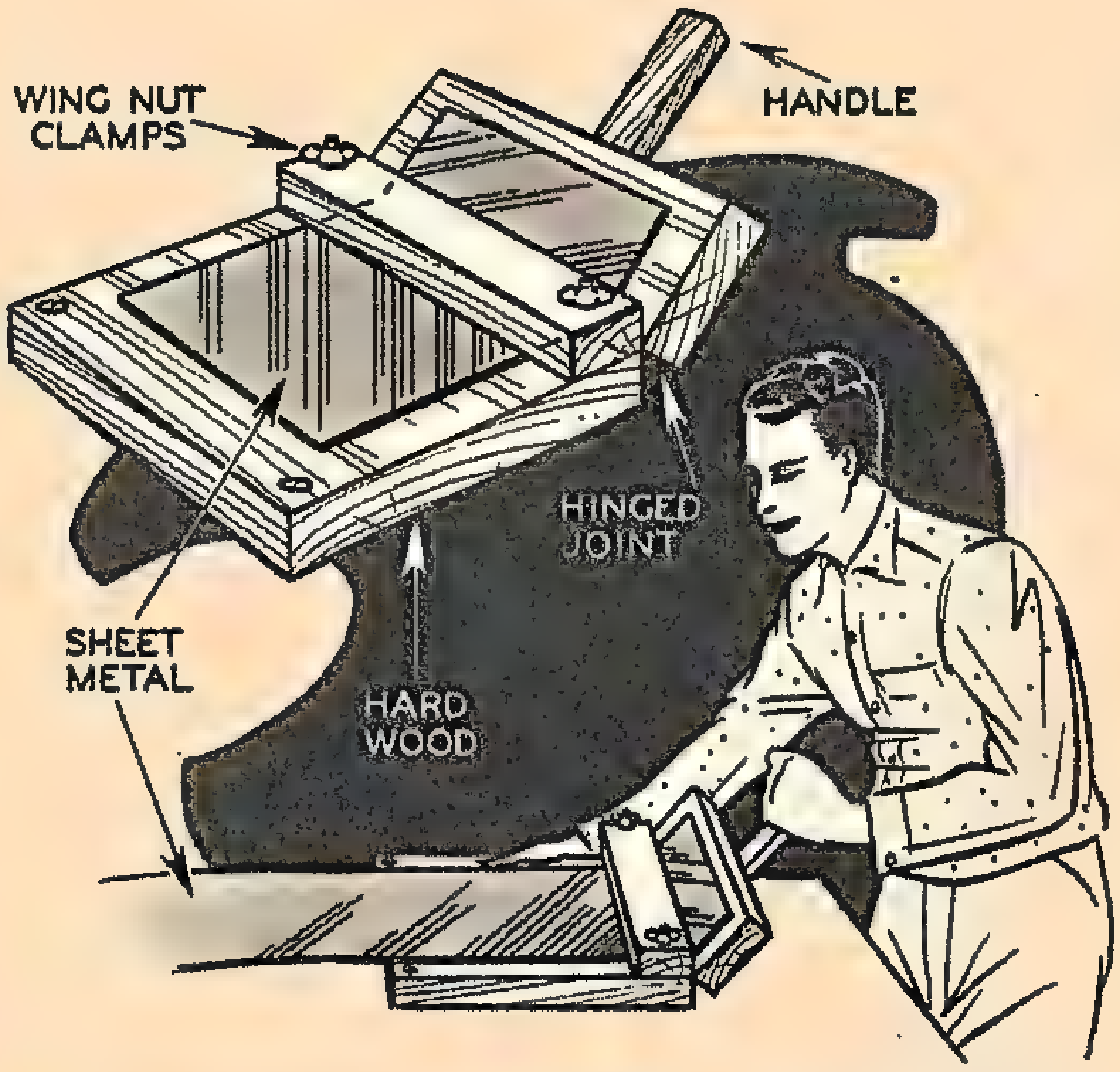
A single slice slipped over a large screw hook makes a good strain insulator for tying wires to buildings or posts, as in anchoring guy wires. There is no danger of breakage here.


MAGNETIC SPEAKER POSTS
2 MFD. CONDENSER
TO EXTRA SPKR.
MAG. SPKR.
TO SET
TO GROUND
SWITCH

Above method of connecting extra speaker with only single wire applies to radio sets having magnetic, not dynamic speakers. Place s. p. s. t. switch near speaker as shown here.

Jig Bends Sheet Metal Accurately

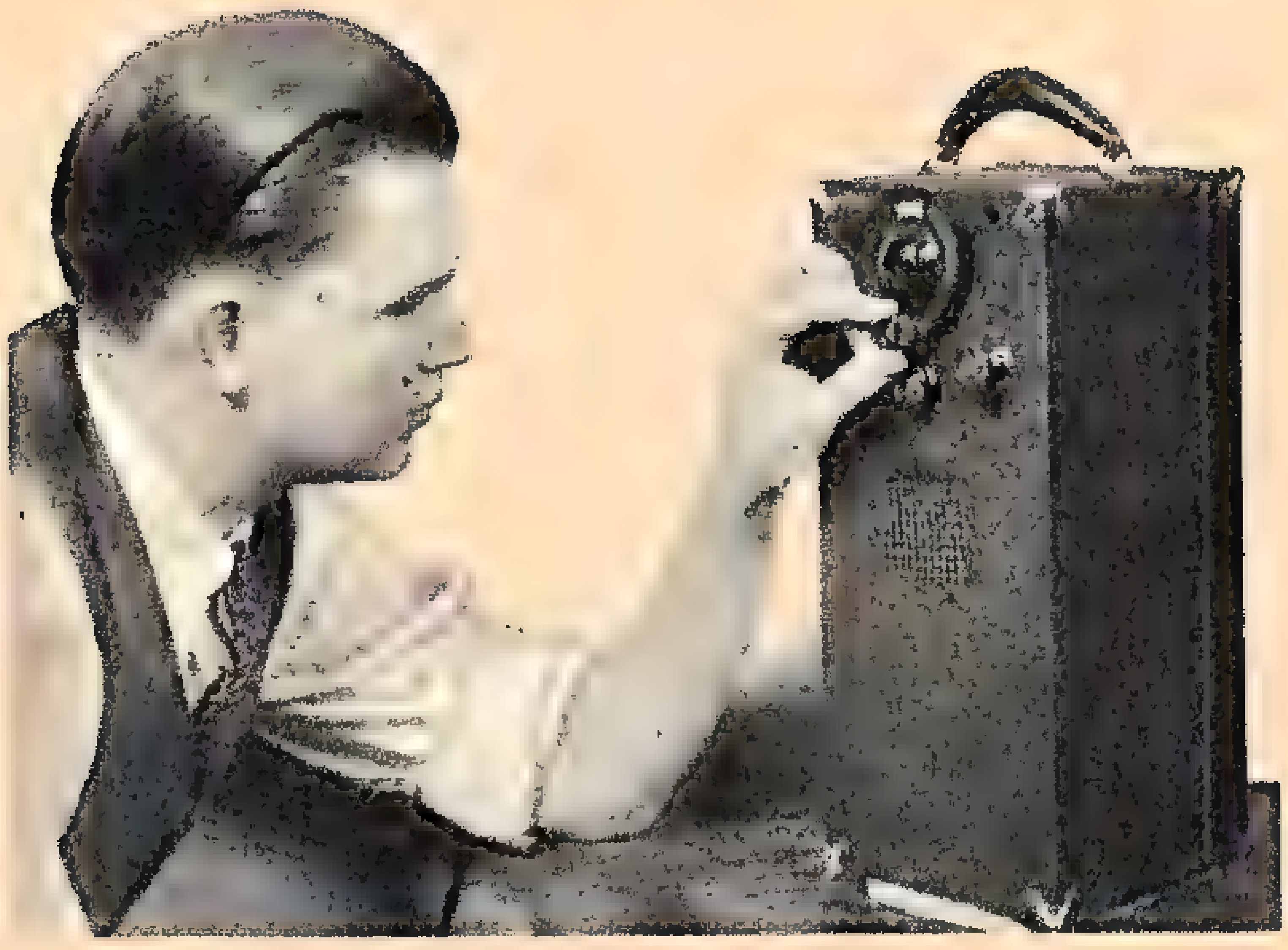
WITH this easily built jig, sheet metal for radio cabinets may be quickly and evenly bent to any desired angle up to 90 degrees. Two boards are hinged together, with a wood clamp to hold the metal in position while one of the hinged portions is being raised. Use hardwood throughout especially if you plan to bend sheet steel.


WING NUT CLAMPS
HANDLE
HINGED JOINT
SHEET METAL
HARD WOOD

Metal panels are neatly and quickly bent with this simple jig.

Hear All-Wave Programs With

Though no plug-in coils are used, programs down to 35 meters can be heard with speaker volume on this powerful long and short wave portable receiver.



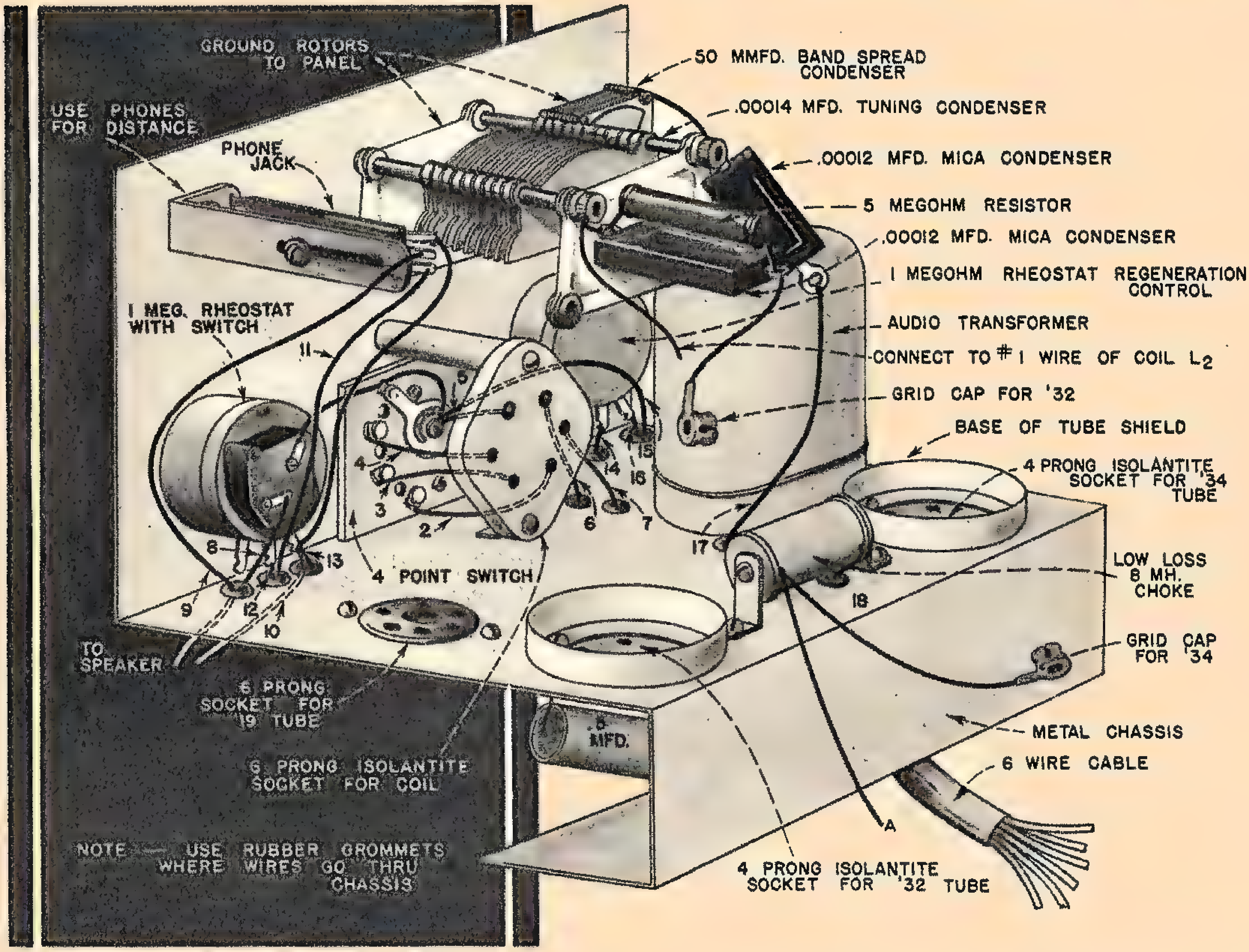
Set your toolbox portable anywhere, connect up antenna and ground leads, flip the switch, and take your pick of music, police calls, or amateur short wave broadcasts o'er the continent. Switch for long or short antenna is on back cover.

SIMPLY connect up the aerial and ground wires, and this powerful little receiver is ready to pick up stations anywhere in this country, on any band from 35 to about 370 meters, with good volume on the built-in midget loudspeaker. Take it anywhere—on a canoe, cruiser, or along to camp this summer—it doesn't take much of an aerial to pick up stations on the broadcast band hundreds of miles away.

An ingeniously wound coil covers four different bands simply by changing the setting on a four point selector switch. There is none of the nuisance of carrying along plug in coils for the different short wave bands, and opening up the set each time you wish to change bands.

Everything is built into the single tool box cabinet. Light weight B and C batteries give unusually long service, since the current drain with the circuit used is very low. Two dry cells supply filament power.

Rain or snow have no threats for this sturdily built receiver. Its depend-


GROUND ROTORS TO PANEL
USE PHONES FOR DISTANCE
PHONE JACK
50 MMFD. BAND SPREAD CONDENSER
.00014 MFD. TUNING CONDENSER
.00012 MFD. MICA CONDENSER
5 MEGOHM RESISTOR
.00012 MFD. MICA CONDENSER
1 MEGOHM RHEOSTAT REGENERATION CONTROL
AUDIO TRANSFORMER
CONNECT TO #1 WIRE OF COIL L2
GRID CAP FOR '32
BASE OF TUBE SHIELD
4 PRONG ISOLANTITE SOCKET FOR '34 TUBE
1 MEG. RHEOSTAT WITH SWITCH
11
5
4
3
2
15
14
16
6
7
17
18
8
9
12
10
13
4 POINT SWITCH
LOW LOSS 8 MH. CHOKE
GRID CAP FOR '34
TO SPEAKER
6 PRONG SOCKET FOR 19 TUBE
.5 MFD.
METAL CHASSIS
6 WIRE CABLE
6 PRONG ISOLANTITE SOCKET FOR COIL
A
NOTE — USE RUBBER GROMMETS WHERE WIRES GO THRU CHASSIS
4 PRONG ISOLANTITE SOCKET FOR '32 TUBE

Mounting of parts atop chassis is shown in above sketch. Ordinary 8 mh. choke gives same results as low-loss type shown.

3-Tube TOOL BOX Portable

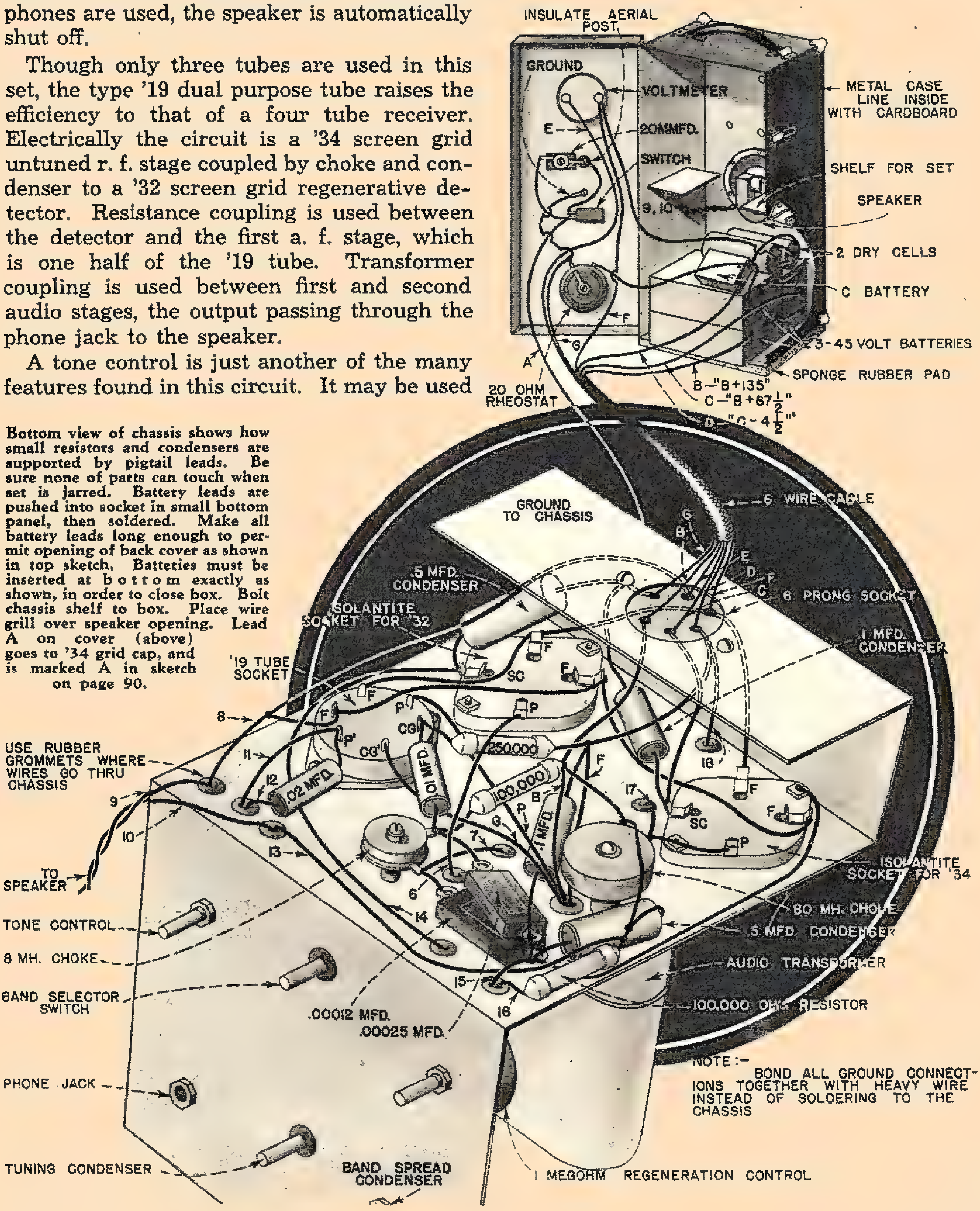
by P. M. OHLINGER

ability makes it the ideal portable set for mining expeditions, explorers, forest patrol rangers, or even for interference finding. A phone jack is provided to permit headphone reception of distant short wave stations. When phones are used, the speaker is automatically shut off.

Though only three tubes are used in this set, the type '19 dual purpose tube raises the efficiency to that of a four tube receiver. Electrically the circuit is a '34 screen grid untuned r. f. stage coupled by choke and condenser to a '32 screen grid regenerative detector. Resistance coupling is used between the detector and the first a. f. stage, which is one half of the '19 tube. Transformer coupling is used between first and second audio stages, the output passing through the phone jack to the speaker.

A tone control is just another of the many features found in this circuit. It may be used either for selecting the tone desired or for cutting down background noises on local reception.

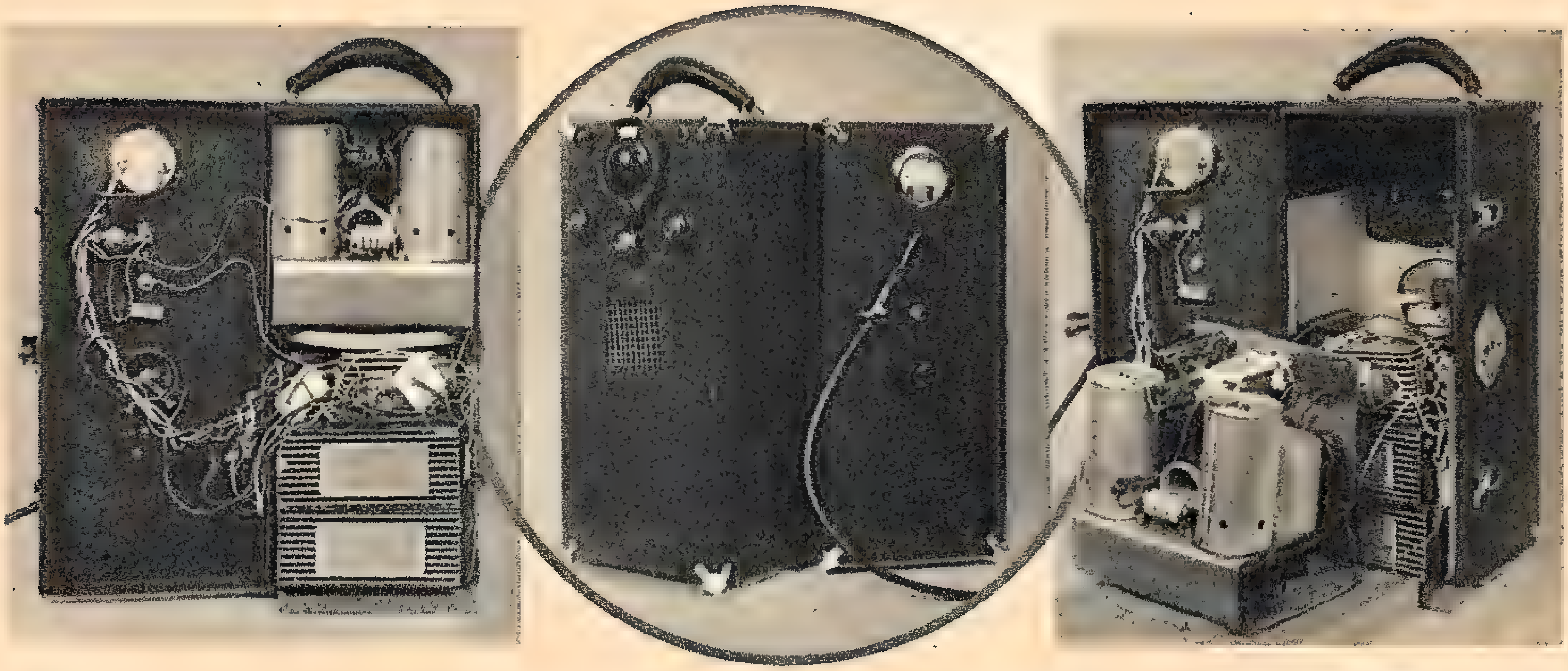
A 16" by 7½" by 7¼" 22-gauge steel tool case is used as a cabinet. It presents a fine appearance and takes very little machine work.



Bottom view of chassis shows how small resistors and condensers are supported by pigtail leads. Be sure none of parts can touch when set is jarred. Battery leads are pushed into socket in small bottom panel, then soldered. Make all battery leads long enough to permit opening of back cover as shown in top sketch. Batteries must be inserted at bottom exactly as shown, in order to close box. Bolt chassis shelf to box. Place wire grill over speaker opening. Lead A on cover (above) goes to '34 grid cap, and is marked A in sketch on page 90.

INSULATE AERIAL POST
GROUND
VOLTMETER
E
20MMFD.
SWITCH
9, 10
F
G
A
20 OHM RHEOSTAT
METAL CASE LINE INSIDE WITH CARDBOARD
SHELF FOR SET
SPEAKER
2 DRY CELLS
C BATTERY
3-45 VOLT BATTERIES
SPONGE RUBBER PAD
B—"B+135"
C—"B+67½"
D—"C-4½"
GROUND TO CHASSIS
6 WIRE CABLE
G
B
E
D
F
C
6 PRONG SOCKET
.5 MFD. CONDENSER
ISOLANTITE SOCKET FOR '32
'19 TUBE SOCKET
1 MFD. CONDENSER
F
SC
F
P
F
F
P
CG
CG
P'
8
11
12
.02 MFD.
.01 MFD.
250,000
100,000
B
P
G
.1 MFD.
7
F
17
18
SC
F
F
P
USE RUBBER GROMMETS WHERE WIRES GO THRU CHASSIS
9
10
13
6
14
TO SPEAKER
TONE CONTROL
8 MH. CHOKE
BAND SELECTOR SWITCH
.00012 MFD.
.00025 MFD.
15
16
ISOLANTITE SOCKET FOR '34
80 MH. CHOKE
.5 MFD. CONDENSER
AUDIO TRANSFORMER
100,000 OHM RESISTOR
NOTE:— BOND ALL GROUND CONNECTIONS TOGETHER WITH HEAVY WIRE INSTEAD OF SOLDERING TO THE CHASSIS
PHONE JACK
TUNING CONDENSER
BAND SPREAD CONDENSER
1 MEGOHM REGENERATION CONTROL

Selector Switch Permits Reception Of All Wave Bands On Single Coil



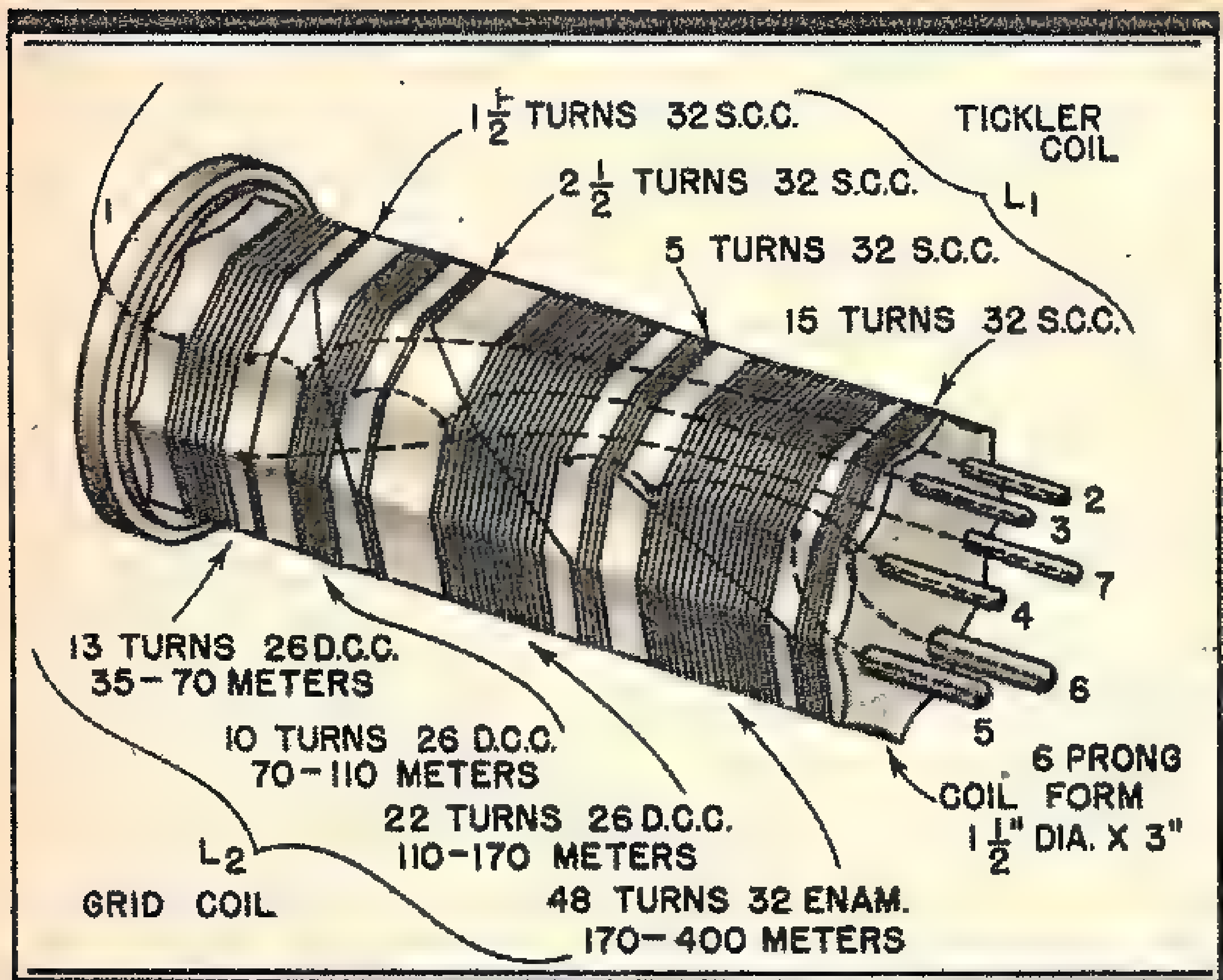
Three views of completed set show how compactly parts are arranged. To slide out chassis, loosen screw on tuning dial coupling, then take off all other front panel control knobs.

Drill out the rivets that hold the handle to the lid. The box is stood on end and the handle fastened to the top. Bolt a sponge rubber pad to the bottom of the box to take up shock and vibration. Drill holes for the antenna, ground posts and volt-meter on the rear door. The front panel of the box must be drilled or cut out for the speaker opening and for the controls. The five inch magnetic speaker will fit in very easily.

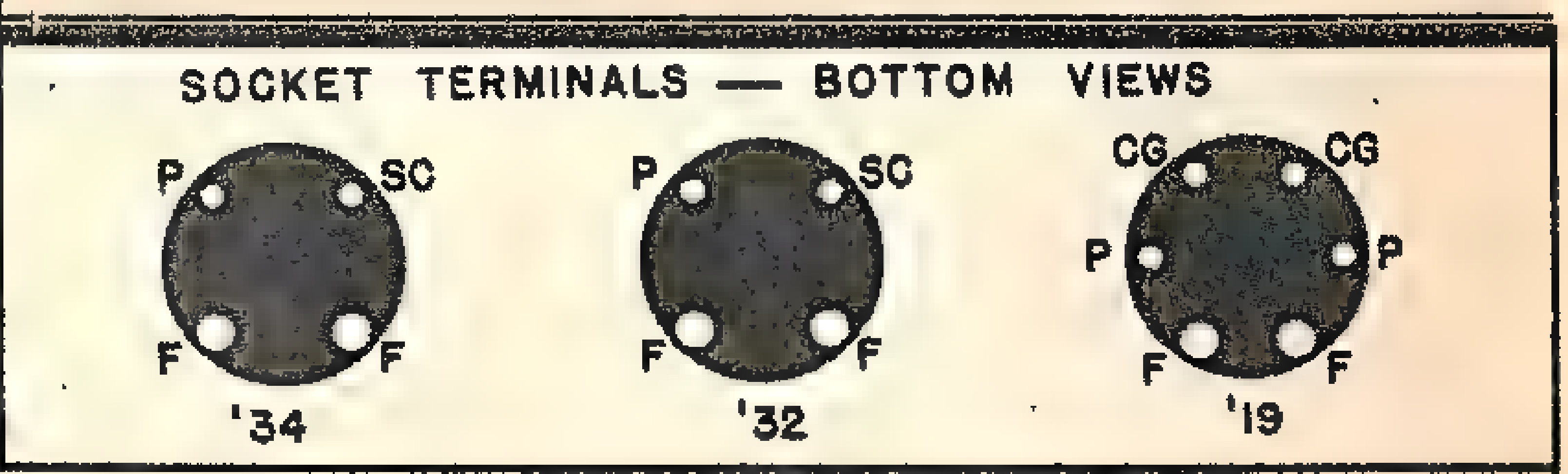
The inside of the box should be lined with cardboard to prevent battery shorts and to make acoustics better.

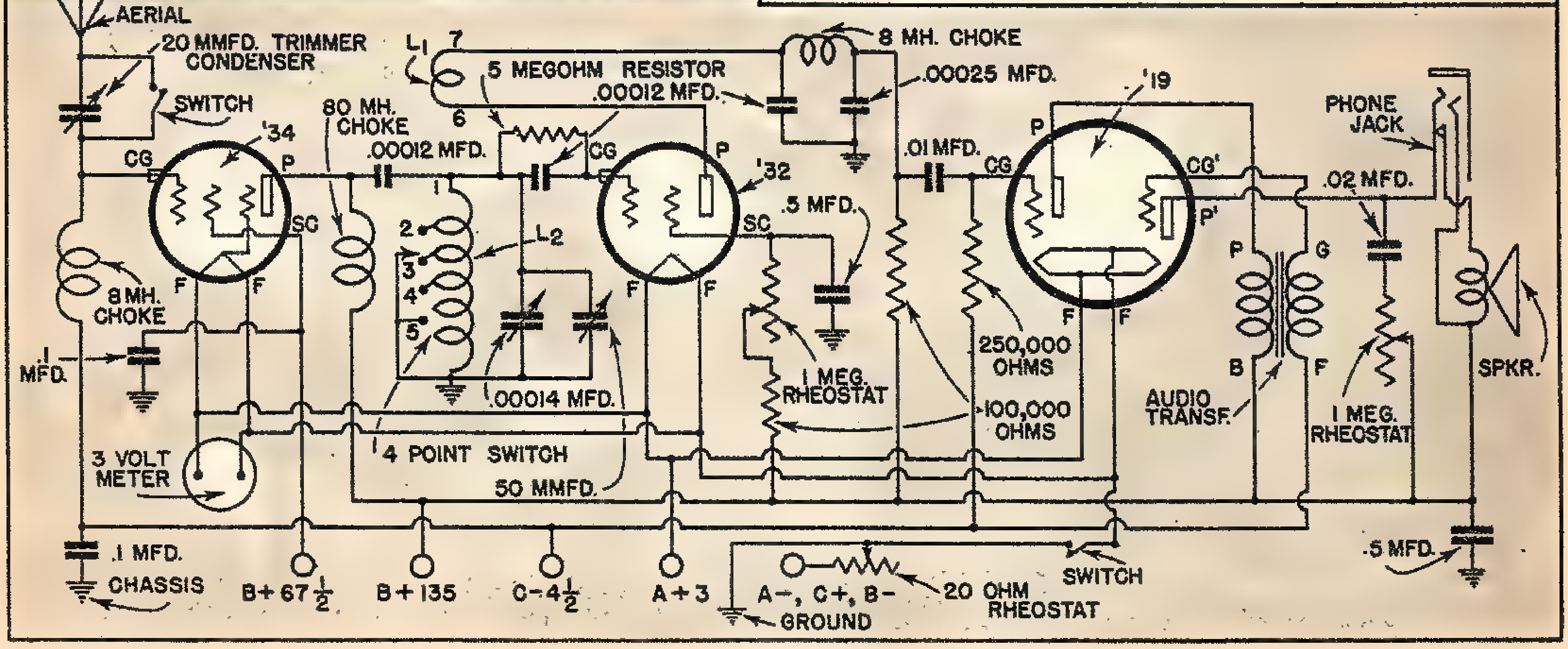
A vernier dial is fastened to the control panel by its extended bolts. Then a bushing

[*Continued on page* 128]


1
1½ TURNS 32 S.C.C.
TICKLER COIL
2½ TURNS 32 S.C.C.
L1
5 TURNS 32 S.C.C.
15 TURNS 32 S.C.C.
2
3
7
4
6
5
6 PRONG COIL FORM 1½" DIA. X 3"
13 TURNS 26 D.C.C. 35-70 METERS
10 TURNS 26 D.C.C. 70-110 METERS
22 TURNS 26 D.C.C. 110-170 METERS
L2
GRID COIL
48 TURNS 32 ENAM. 170-400 METERS

Wind coil exactly as shown, spacing grid windings $\frac{5}{16}$" apart. Circuit diagram is given below. Filament rheostat is adjusted to control volume and regeneration. Filament meter should never be allowed to go higher than 2 volts. Use low-priced 3-volt D. C. meter. Aerial binding post is on back cover. Ground post, on cover, is not insulated from the tool box.

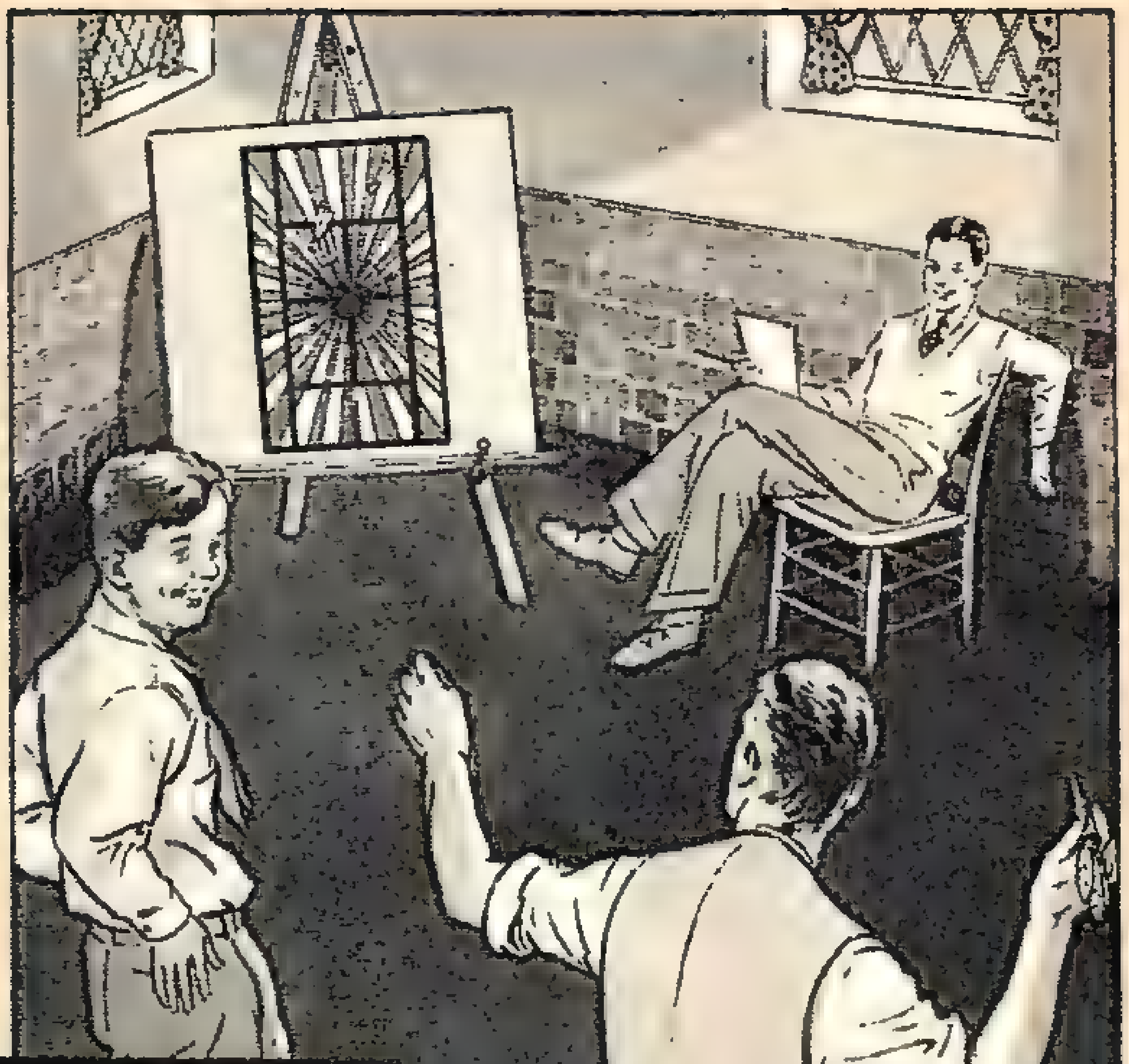

SOCKET TERMINALS — BOTTOM VIEWS
P
SC
F
F
'34
P
SC
F
F
'32
CG
CG
P
P
F
F
'19

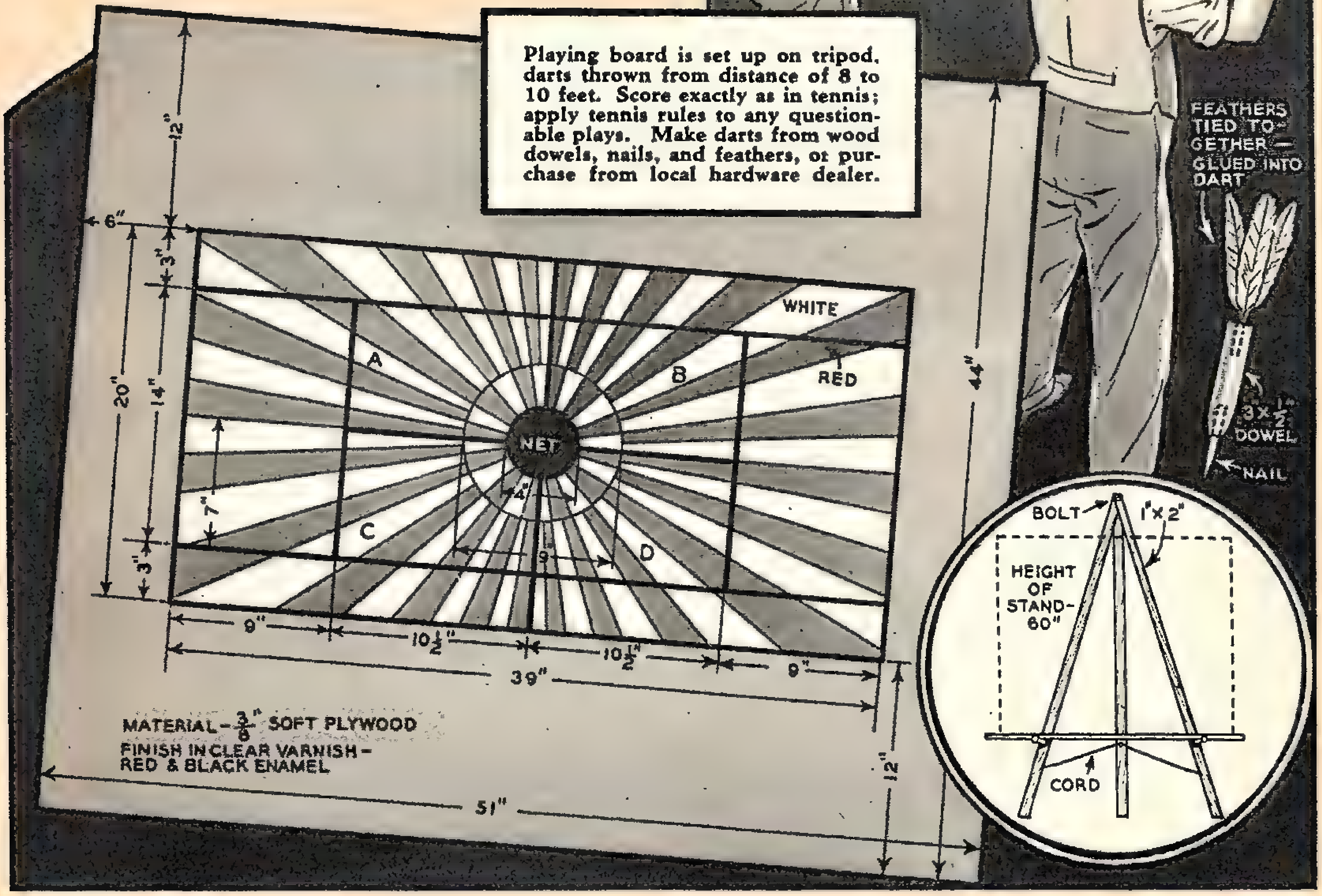

AERIAL
20 MMFD. TRIMMER CONDENSER
SWITCH
'34
CG
P
SC
F
F
8 MH. CHOKE
.1 MFD.
3 VOLT METER
.1 MFD.
CHASSIS
B+67½
B+135
C-4½
A+3
A-, C+, B-
GROUND
L1
7
6
5 MEGOHM RESISTOR
.00012 MFD.
80 MH. CHOKE
.00012 MFD.
1
2
3
4
5
L2
.00014 MFD.
4 POINT SWITCH
50 MMFD.
CG
P
'32
SC
F
F
8 MH. CHOKE
.00025 MFD.
.5 MFD.
1 MEG. RHEOSTAT
.01 MFD.
250,000 OHMS
100,000 OHMS
'19
P
CG
CG'
P'
F
F
20 OHM RHEOSTAT
SWITCH
P
G
B
F
AUDIO TRANSF.
.02 MFD.
1 MEG. RHEOSTAT
PHONE JACK
SPKR.
.5 MFD.

Tennis Rules Apply to Indoor Dart Game

EXCEPT for the fact that darts are used instead of balls, this fascinating game is played in the same manner as lawn tennis. Just as much skill is required to place the darts in the proper court areas as to return the ball in real tennis games. While designed here for indoor use, dart tennis may also be played out-of-doors.

The game board is a piece of soft plywood 44″x51″ in size, finished in clear varnish. On this board is painted a layout of a standard tennis court, with a 4″ diameter black circle at the center to represent the net, and radial streaks of alternate colors to indicate failure to return the ball.




12"
6"
3"
20"
14"
7"
3"
A
B
C
D
WHITE
RED
NET
4"
9
9"
10½"
10½"
9"
39"
44"
12"
51"
MATERIAL - 3/8" SOFT PLYWOOD
FINISH IN CLEAR VARNISH - RED & BLACK ENAMEL
FEATHERS TIED TOGETHER — GLUED INTO DART
3×½" DOWEL
NAIL
BOLT
1"x2"
HEIGHT OF STAND-60"
CORD

Playing board is set up on tripod, darts thrown from distance of 8 to 10 feet. Score exactly as in tennis; apply tennis rules to any questionable plays. Make darts from wood dowels, nails, and feathers, or purchase from local hardware dealer.

Mark out playing board on plywood as indicated above, then finish with enamel in colors marked. Tripod is shown at right.

The game is played as follows: Assume that two players, yellow and blue, are playing singles. Suppose blue is to serve first from the left court. He is entitled to two darts; if the first is placed within Court B he does not throw the second. A dart in the black circle is net ball, and must be served over. If blue gets a dart on the white streak in B, receiving player must now place his dart on a white court area on the other side of the net. If blue had landed on a red area, yellow would likewise aim for the red area. A dart on the wrong color indicates failure to return the ball.

Darts outside the court boundaries are of course called outside. Play continues until one player fails to place a dart on the correct color inside the court boundaries. Blue alternates between courts B and D in serving, while yellow serves into A and C.

Build "MIDGET MILLER"

by WESTON FARMER

PART I

Miniature copy of the famous Miller dirt track racer, this midget has class, beauty, and speed, yet is easily built with common workshop tools.

THIS midget car is a scale model of the famous Miller Dirt Track Special. Built for Merril M. Madsen, of Minneapolis, Minn., dirt track racer and owner of a real Miller, it combines beauty and speed with simplicity of construction.

The car shown in the photos is powered with a ¾ h.p. Briggs and Stratton motor with a kick starter reached by raising the rear hood. This motor develops a speed of 20 miles an hour. The plans and specification given, however, will do for the power head of an outboard motor or one of those washing machine motors that can be found most anywhere.

Unlike most midget cars, the "Midget Miller" has a clutch and a gear shift for forward and reverse that is a simple arrangement of V pulleys and a belt. The car can stop, start, and reverse and come to a proper halt for traffic signals. The body of the car can be built of sheet metal or of wooden molds with chicken wire and fabrikoid cover.

The first step in construction is the frame, made of two oak stringers, 1"x4" and 62" long. These are joined by separators, as shown in Fig 2, with 2" No. 14 steel screws. The rear piece is molded as shown from 2"x3" fir. A tie rod of ¼" cold rolled steel is threaded and fitted in a slot in the bottom of this rear tie piece to strengthen it.

The nose piece may be of the dimensions shown in Fig. 2, which is sketched as a suggestion as to how to handle this part. This nose piece can be cast, or it may be built up of 10 gauge sheet iron, welded at the seams.

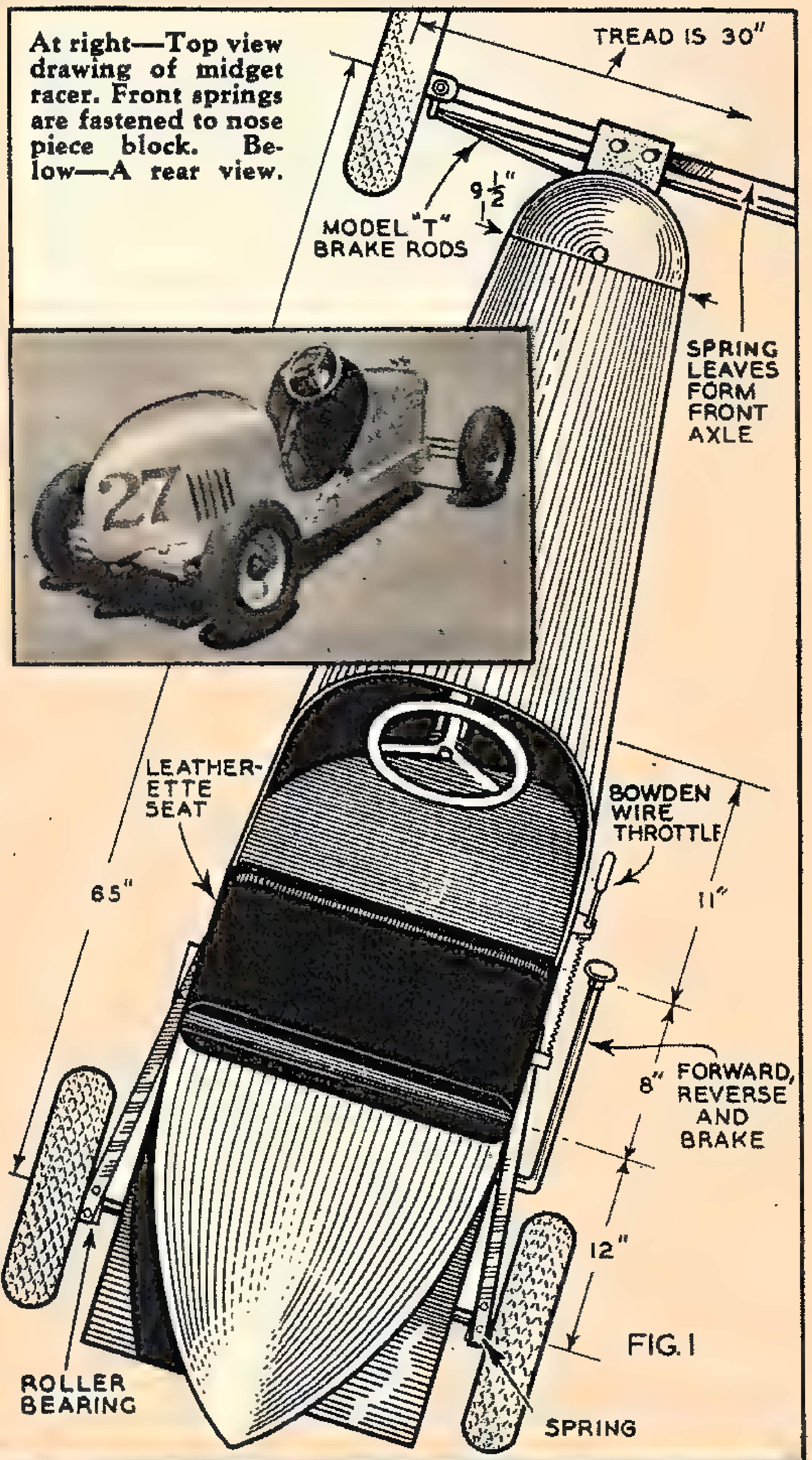
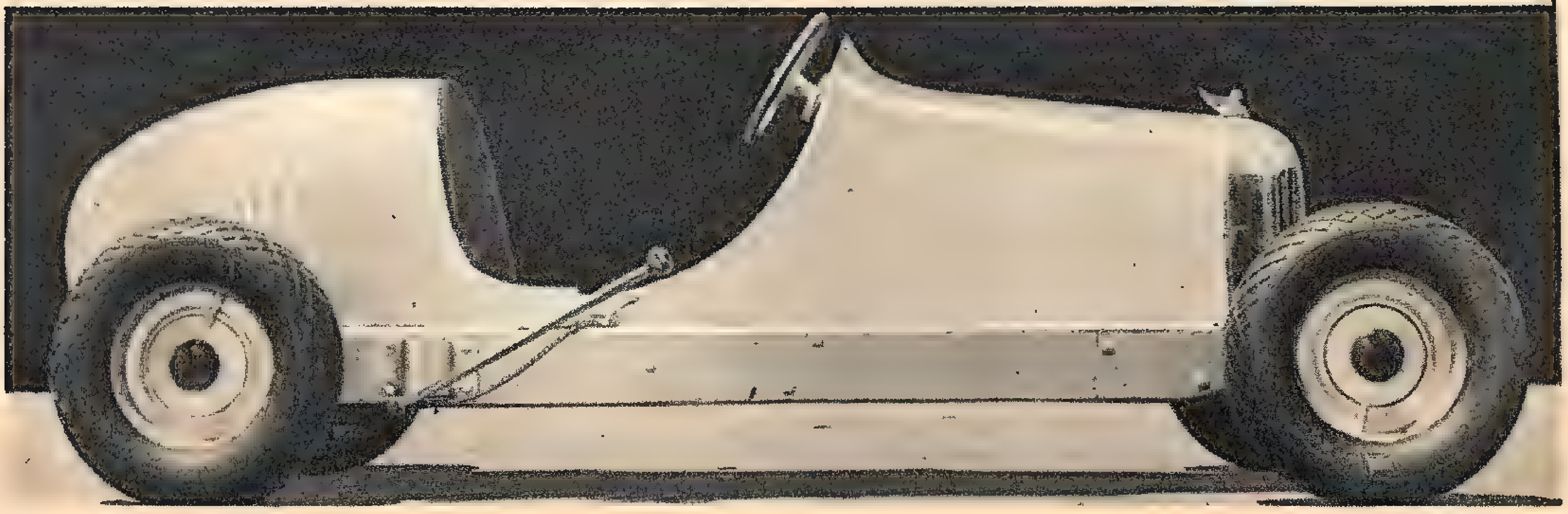


FIG. 1

At right—Top view drawing of midget racer. Front springs are fastened to nose piece block. Below—A rear view.

Below—A side view of the "Miller Midget" racer. Balloon tires come with the wheels. The gear shift is a simple arrangement of pulleys and sliding motor block at rear.



—a Model Dirt Track Racer

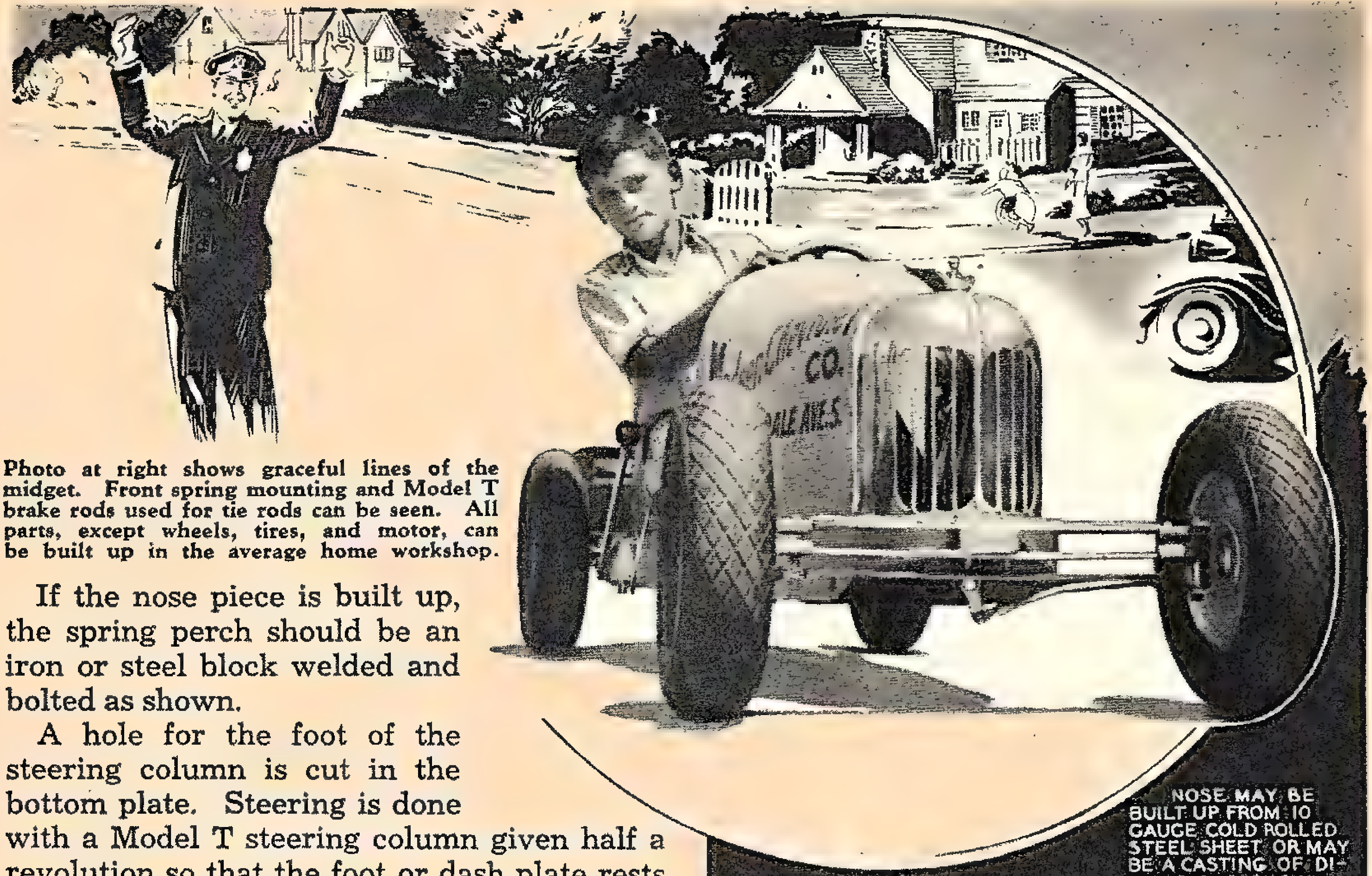


Photo at right shows graceful lines of the midget. Front spring mounting and Model T brake rods used for tie rods can be seen. All parts, except wheels, tires, and motor, can be built up in the average home workshop.

If the nose piece is built up, the spring perch should be an iron or steel block welded and bolted as shown.

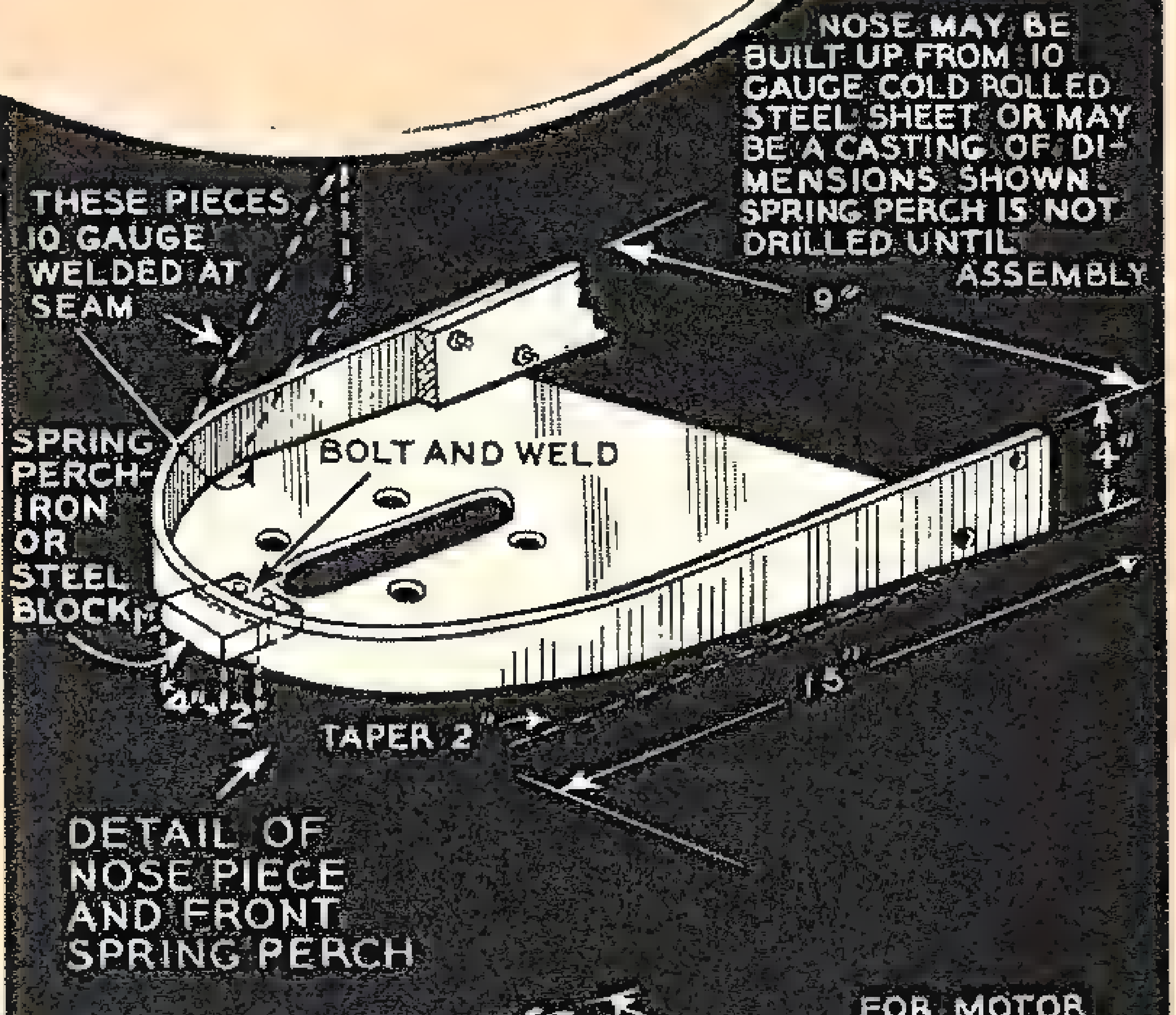
A hole for the foot of the steering column is cut in the bottom plate. Steering is done with a Model T steering column given half a revolution so that the foot or dash plate rests on the nose piece instead of the usual dashboard. Holes are drilled into the bottom plate so the dash plate can be fastened with bolts.

The driver's feet and legs go under the front hood. They rest on the 16 gauge metal floor, extending from the front seat support to the nose piece.

The rear axle is one-inch cold rolled steel

[*Continued on page* 126]

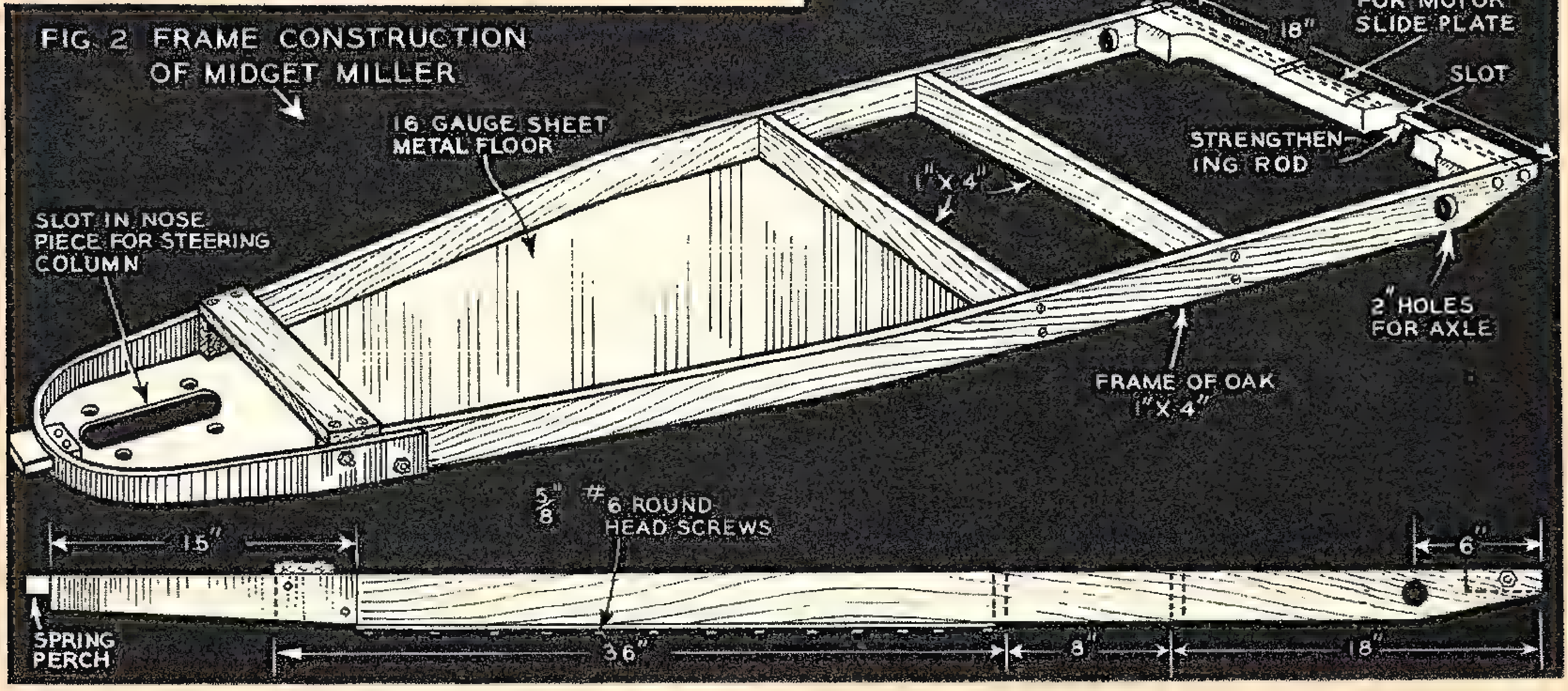
Construction of the frame and nose piece, shown here, is not difficult. Spring perch must be iron or steel for safety. Model T steering column goes through long hole in nose piece bottom. Drill 2" holes for 1" steel rod rear axle.



NOSE MAY BE BUILT UP FROM 10 GAUGE COLD ROLLED STEEL SHEET OR MAY BE A CASTING OF DIMENSIONS SHOWN. SPRING PERCH IS NOT DRILLED UNTIL ASSEMBLY
THESE PIECES 10 GAUGE WELDED AT SEAM
9"
4"
SPRING PERCH-IRON OR STEEL BLOCK
BOLT AND WELD
4"
2"
TAPER 2"
15"

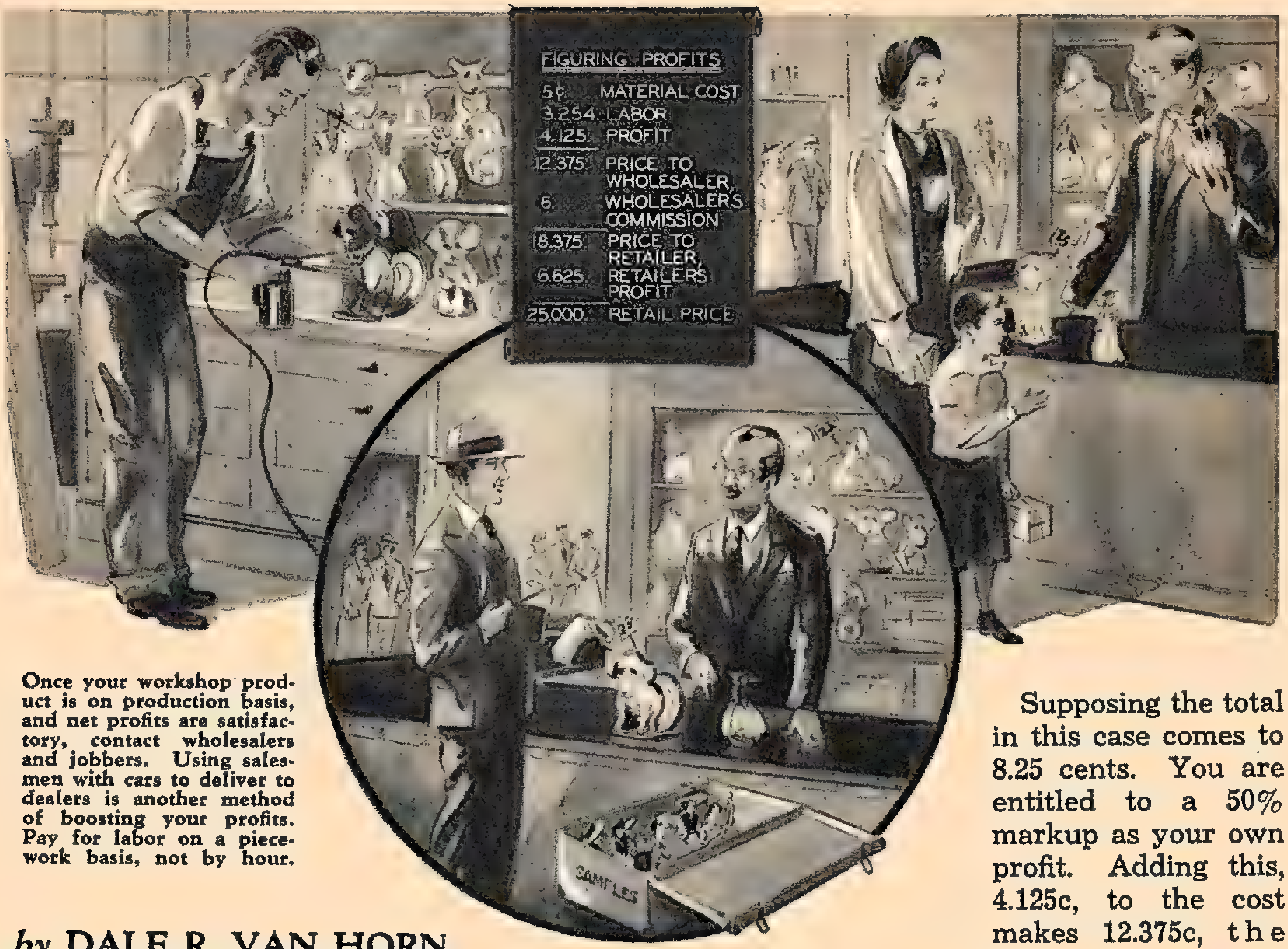
DETAIL OF NOSE PIECE AND FRONT SPRING PERCH

FIG. 2 FRAME CONSTRUCTION OF MIDGET MILLER



16 GAUGE SHEET METAL FLOOR
SLOT IN NOSE PIECE FOR STEERING COLUMN
18"
FOR MOTOR SLIDE PLATE
SLOT
STRENGTHENING ROD
1"X 4"
2" HOLES FOR AXLE
FRAME OF OAK 1"X 4"
5/8" #6 ROUND HEAD SCREWS
15"
6"
SPRING PERCH
36"
8"
18"

How to SELL Your SHOP PRODUCTS



Once your workshop product is on production basis, and net profits are satisfactory, contact wholesalers and jobbers. Using salesmen with cars to deliver to dealers is another method of boosting your profits. Pay for labor on a piecework basis, not by hour.

by DALE R. VAN HORN

THE owner of a home workshop which is well equipped with power tools can at any time utilize his hobby as a means of making a living. At his disposal is all the equipment needed to go into the production of toys and novelties which will find a ready market everywhere.

In any home shop venture, regardless of what type of product is being made, there is just one sure way to figure costs and profits. Get quotations on materials you need from as many manufacturers as possible to get the lowest possible price consistent with quality goods. Let it be known that you plan to go into production, and you will be given wholesale quotations. From these figures, compute your material cost per unit, allowing about 10% for waste and breakage.

The labor cost is an uncertain figure until you have made several hundred items, so figure liberally at first. Remember that any worker naturally speeds up with experience. This labor item, added to that for materials and a pro-rated amount for electricity, machine depreciation, and supplies, gives you the actual cost of the item.

Supposing the total in this case comes to 8.25 cents. You are entitled to a 50% markup as your own profit. Adding this, 4.125c, to the cost makes 12.375c, the lowest figure at which you sell the items in any quantity. You can give this price to salesmen or jobbers.

To retail dealers should be added 33⅓% of this figure, bringing the dealer's cost to about 19 cents. Dealers, in turn expect to make at least a third, and 40 to 60% suits them better. If you also sell your own products, then into your pockets goes both the manufacturing and selling profits.

Selling Price to be Four Times Cost

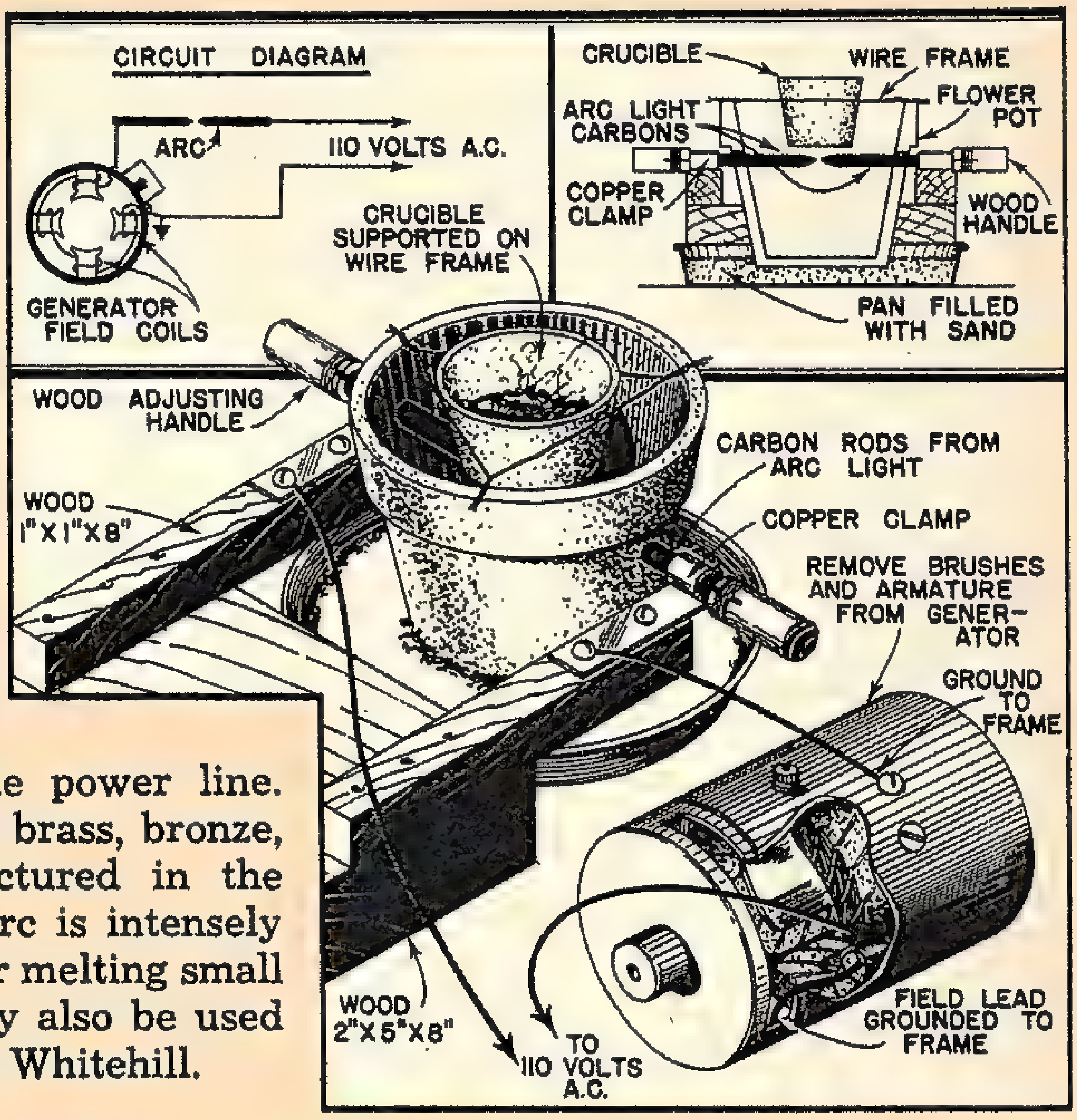
All this is simply a long way of saying that if the item costs you 8.25c, it should retail for at least 30c. This plan, providing the item in question will sell at this figure, will insure the proper profits along the line.

Once you have become established on a firm business basis, keep in mind that the only sure way of controlling your labor costs is to operate on a piece-work basis. Here you pay your help so much for a certain amount of work, your labor costs for any one piece being always the same.

Keep in mind these simple rules for setting prices on your workshop products, if you want to reap the full benefit from your labor, your ideas, and your equipment.

AUTO GENERATOR KINKS

Use Generator as Reactor for Electric Arc Furnace

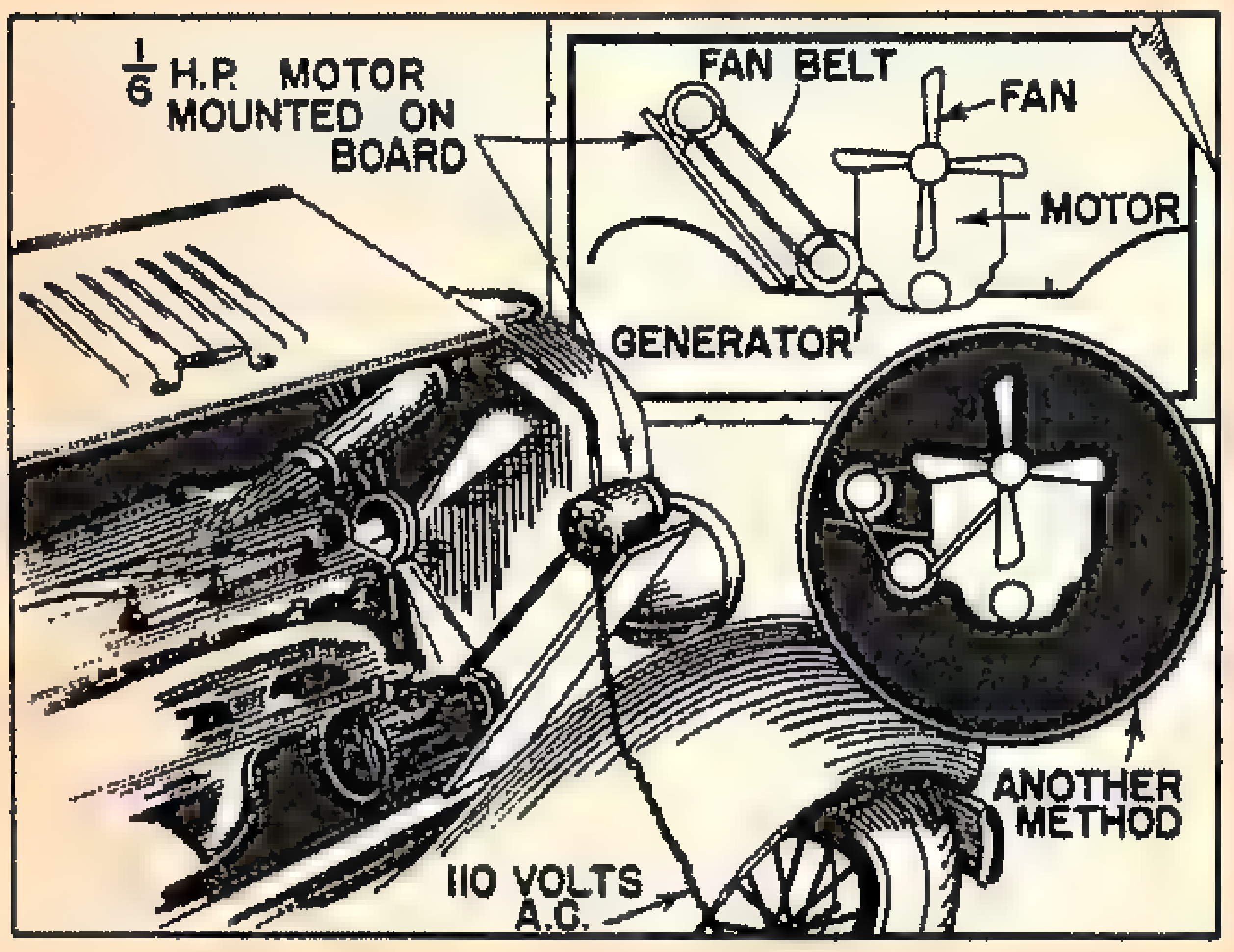

CIRCUIT DIAGRAM
ARC
110 VOLTS A.C.
CRUCIBLE SUPPORTED ON WIRE FRAME
GENERATOR FIELD COILS
CRUCIBLE
WIRE FRAME
FLOWER POT
ARC LIGHT CARBONS
COPPER CLAMP
WOOD HANDLE
PAN FILLED WITH SAND
WOOD ADJUSTING HANDLE
WOOD 1"X1"X8"
CARBON RODS FROM ARC LIGHT
COPPER CLAMP
REMOVE BRUSHES AND ARMATURE FROM GENERATOR
GROUND TO FRAME
WOOD 2"X5"X8"
TO 110 VOLTS A.C.
FIELD LEAD GROUNDED TO FRAME

AN ELECTRIC arc furnace which will operate directly on 110-volt alternating current must have a reactance in series to limit the current when the arc is struck. The field coils of any automobile generator will prove ideal for this reactor.

Remove the armature and brushes, then either bring both field coil leads out directly, or ground one to the generator frame and bring out the other. Connect the coils in series with the carbon arc rods across the power line.

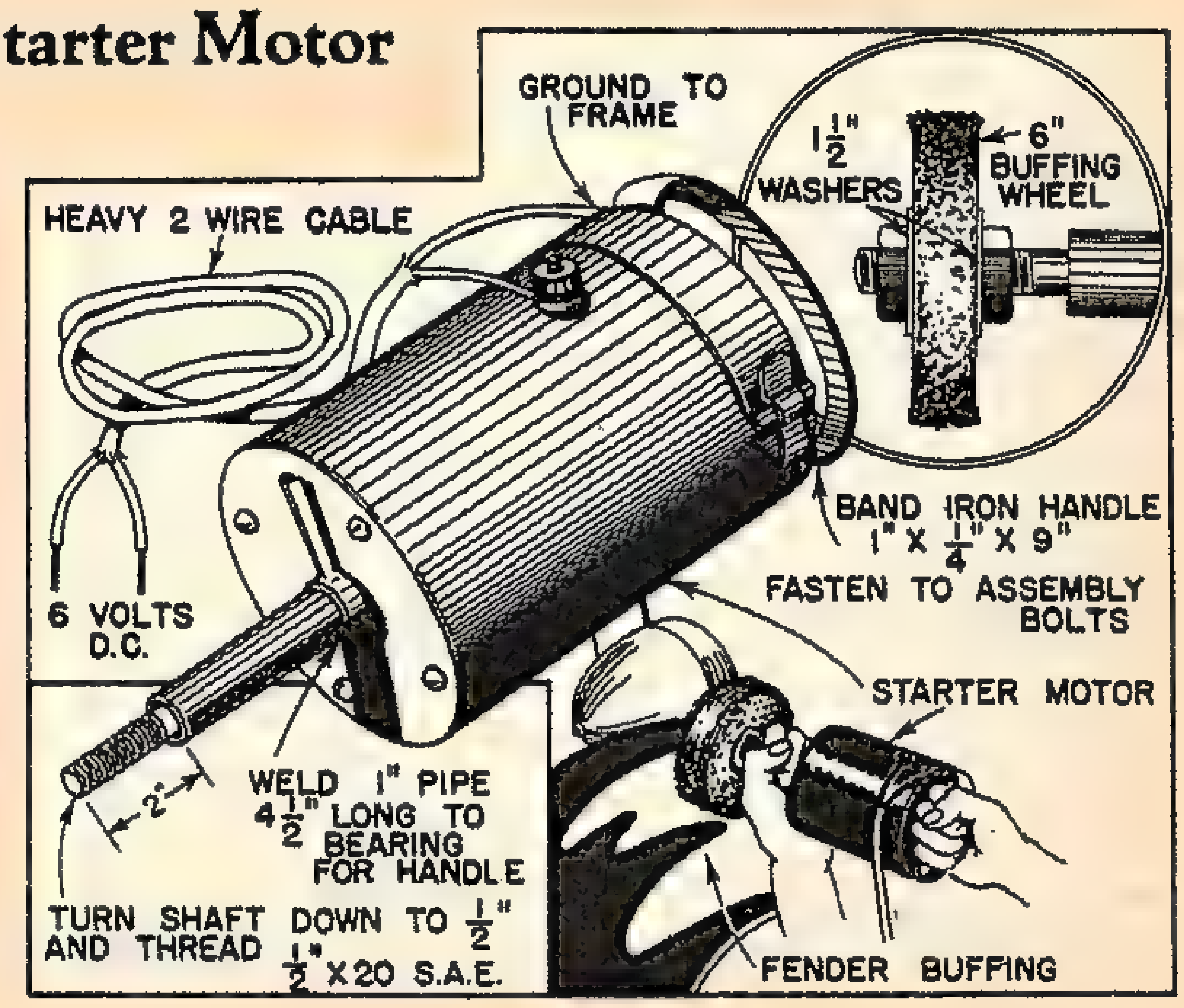
An inexpensive furnace for heating brass, bronze, or lead may be constructed as pictured in the sketches at the right. The electric arc is intensely hot, and will prove very convenient for melting small quantities of metal. This reactor may also be used for an arc light flood lamp.—Carrol R. Whitehill.

Electric Motor Helps Charge Car Battery


1/6 H.P. MOTOR MOUNTED ON BOARD
FAN BELT
FAN
MOTOR
GENERATOR
ANOTHER METHOD
110 VOLTS A.C.

WHEN your car battery is down, here's a kink that will bring the battery up in a short time. On a small board mount an electric motor having a V-belt pulley. Remove the fan belt from your car engine, and connect electric motor and car generator together with it. The length of the board should be such that the weight of the motor tightens the belt. The ammeter will tell you if the generator is being turned in the correct direction.—R. F. Jennings.

High Speed Auto Polisher Uses Any Starter Motor

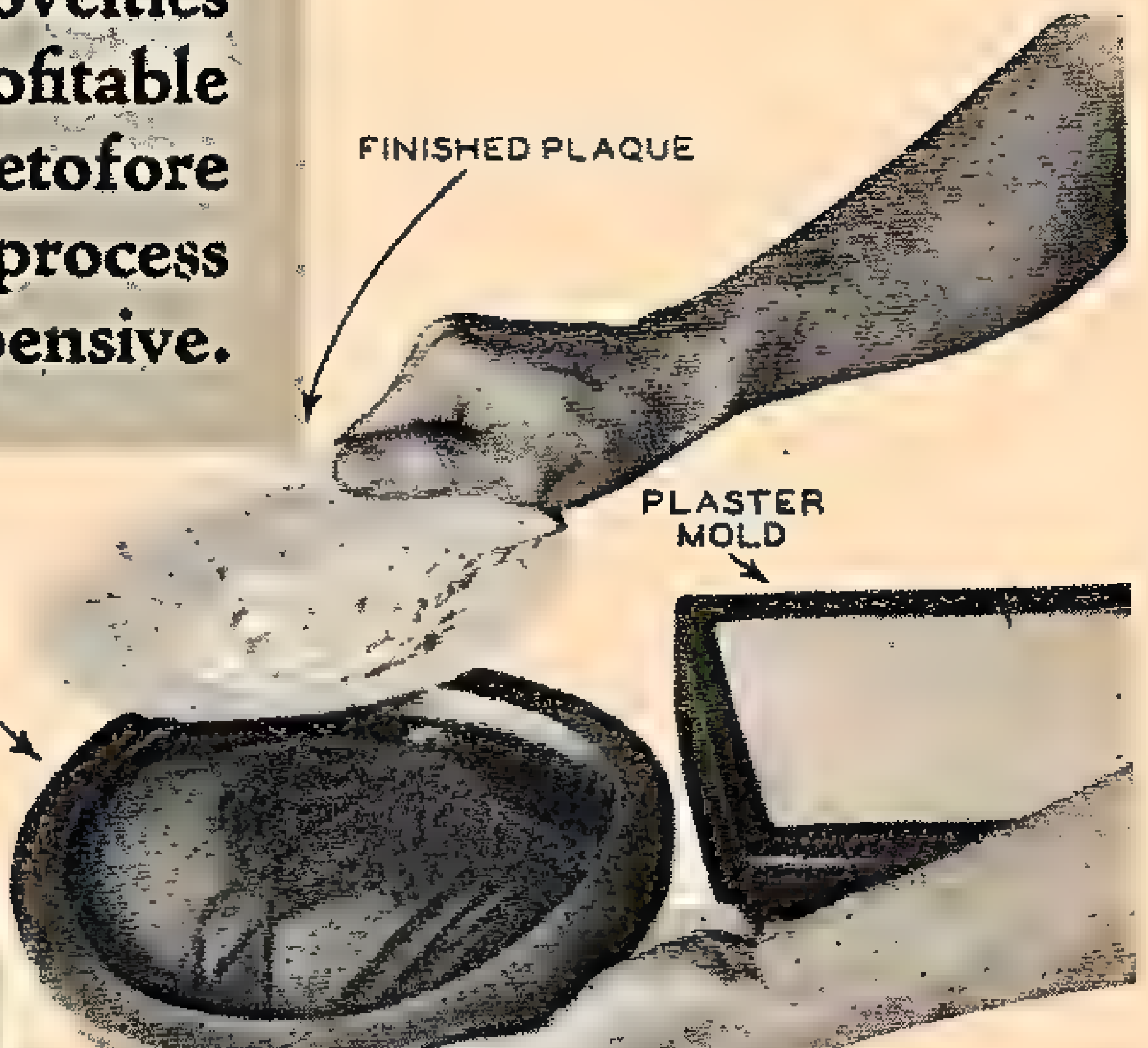

GROUND TO FRAME
1 1/2" WASHERS
6" BUFFING WHEEL
HEAVY 2 WIRE CABLE
BAND IRON HANDLE 1" X 1/4" X 9"
FASTEN TO ASSEMBLY BOLTS
6 VOLTS D.C.
STARTER MOTOR
2"
WELD 1" PIPE 4 1/2" LONG TO BEARING FOR HANDLE
TURN SHAFT DOWN TO 1/2" AND THREAD 1/2"X20 S.A.E.
FENDER BUFFING

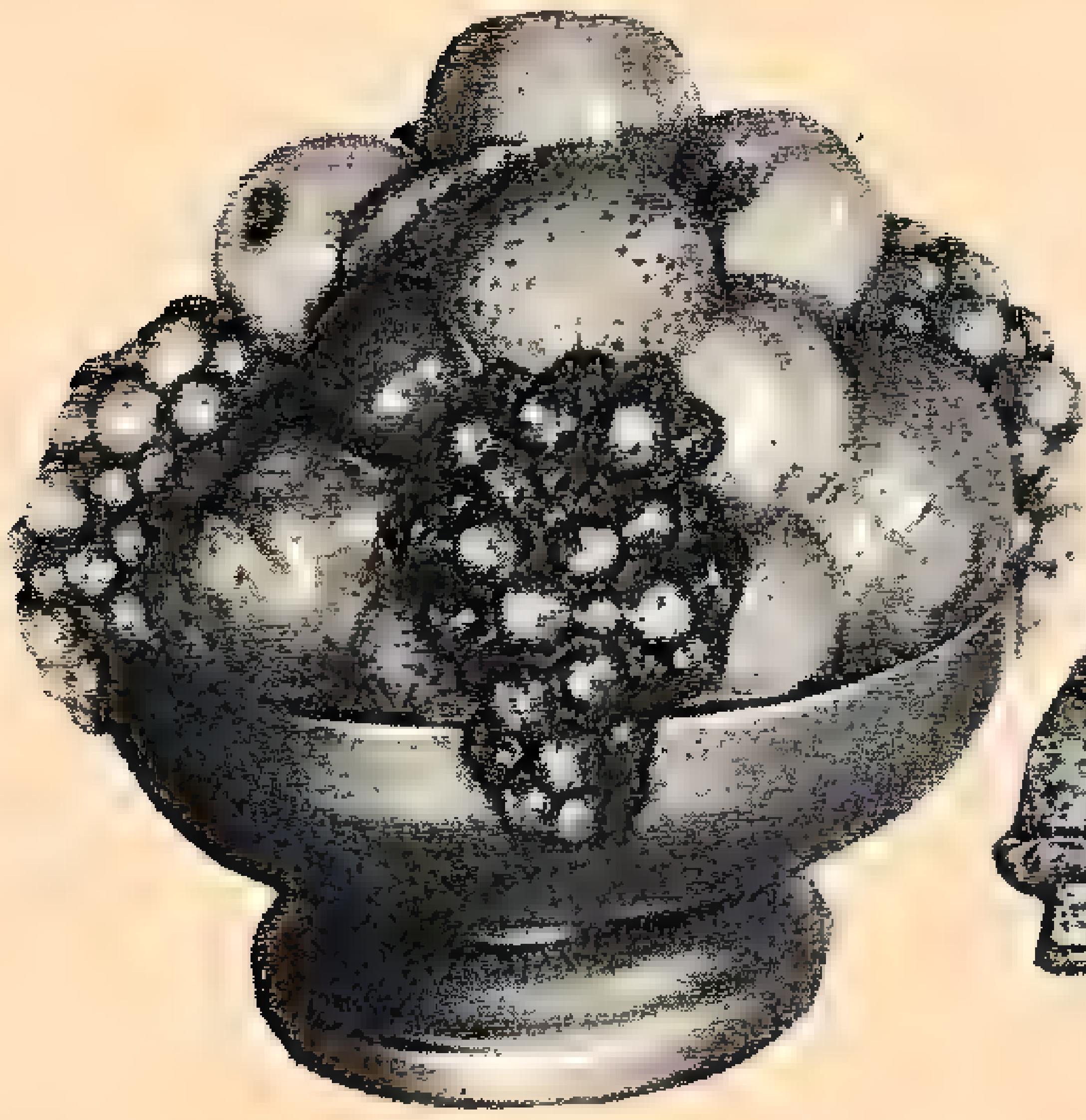
POLISHING and waxing of a car, if done by hand, can be a very tedious job. With this starter motor-powered buffing wheel operating directly from the car battery, a brilliant polish may be obtained in an hour.

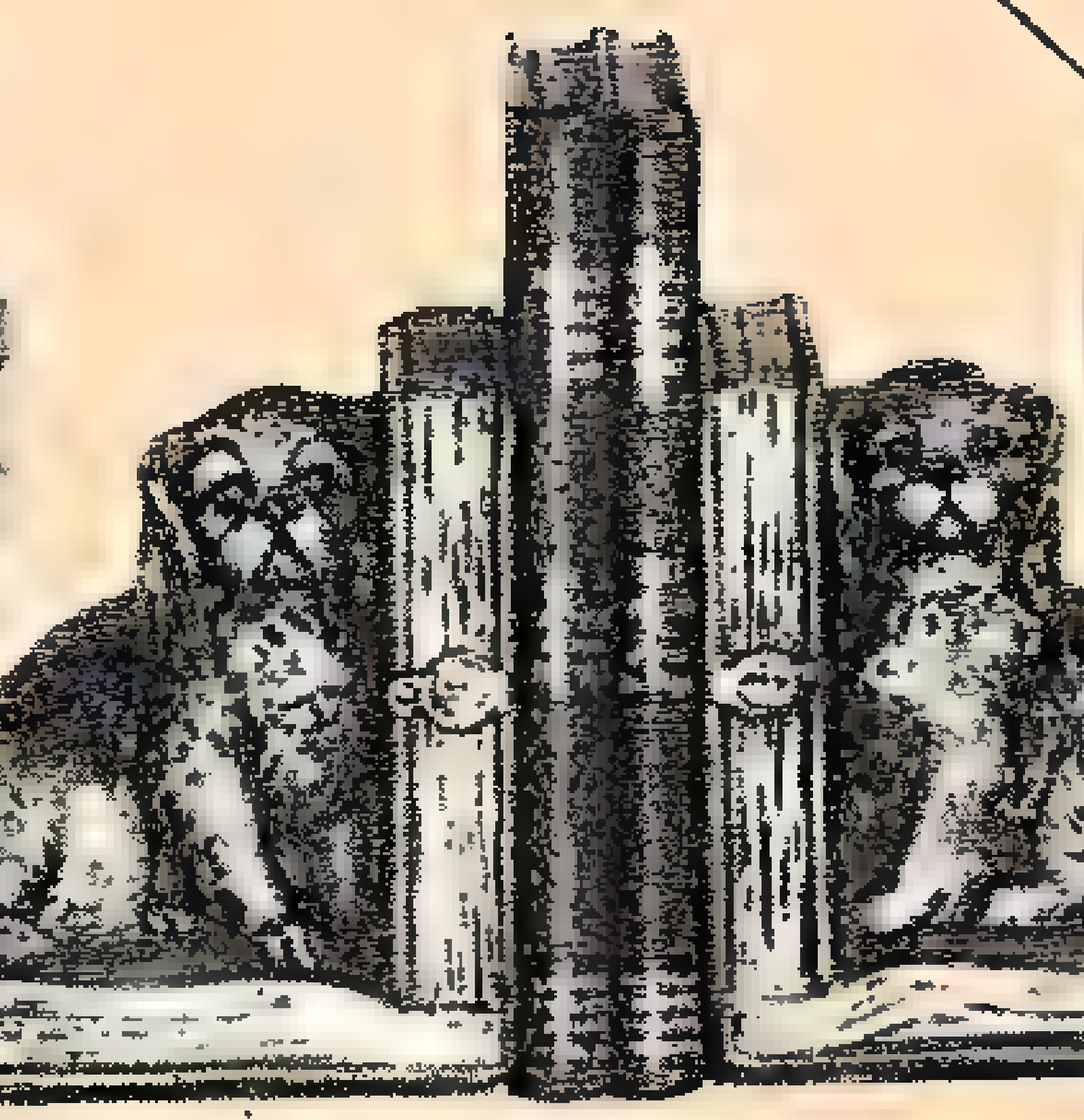
Turn down the armature shaft to take a standard 6″ buffing wheel. Two handles are fastened to the starter in the manner indicated by the sketches. Connect the starter to the battery with long, flexible No. 14 rubber covered leads. A heavier wire would draw more current than is needed here. A switch may be mounted on the starter if desired.—Lawrence Kay.

Mold PLASTER Novelties With Gelatin

Though the making of plaster composition novelties with flexible molds is a pleasant as well as profitable occupation, information on the subject has heretofore been difficult to obtain. The molding gelatin process explained here is surprisingly simple and inexpensive.







Fruit bowls, book ends, and plaques like those shown above are easily made in quantities from plaster composition by flexible molding process described in detail in this article.

Above—Plaques may be easily lifted out of gelatin molds, and mold used over and over again. Below—Model in form is ready for pouring with molding gelatin. Metal form is backed up by plaster mixture to prevent loss of gelatin.

IN THE making of plaques, statues, book ends, or other plaster novelties on a production basis, a knowledge of flexible mold making will prove invaluable. Model makers, too, can save time and money with these gelatin molds especially when large numbers of an intricate plaster fitting are needed.

Molding gelatin has many of the characteristics of rubber, being flexible, elastic, and tough, yet it will melt at a temperature even less than that of boiling water. The gelatin may be used over and over again by remelting.

The making of the form is the first step in this new molding process. The model being copied is glued flat side down on a smooth board or piece of tin. With strips of wood or tin set up a form about ½" higher than the model and at least ¾" away from it at all points. Cement down the outside edges of this form with a thick mixture of molding plaster and water, and allow to set.

If the model used is painted, give it a coat of clear varnish to protect the finish. If it is marble or a plaster composition, warm it up a little before pouring on hot gelatin, to prevent cracking.

The molding gelatin usually comes in flat slabs about 1½" thick. Cut this up into 1½" squares, and melt in a double boiler. Allow the water to boil slowly until the gelatin is thoroughly melted, but do not allow the gelatin itself to boil.

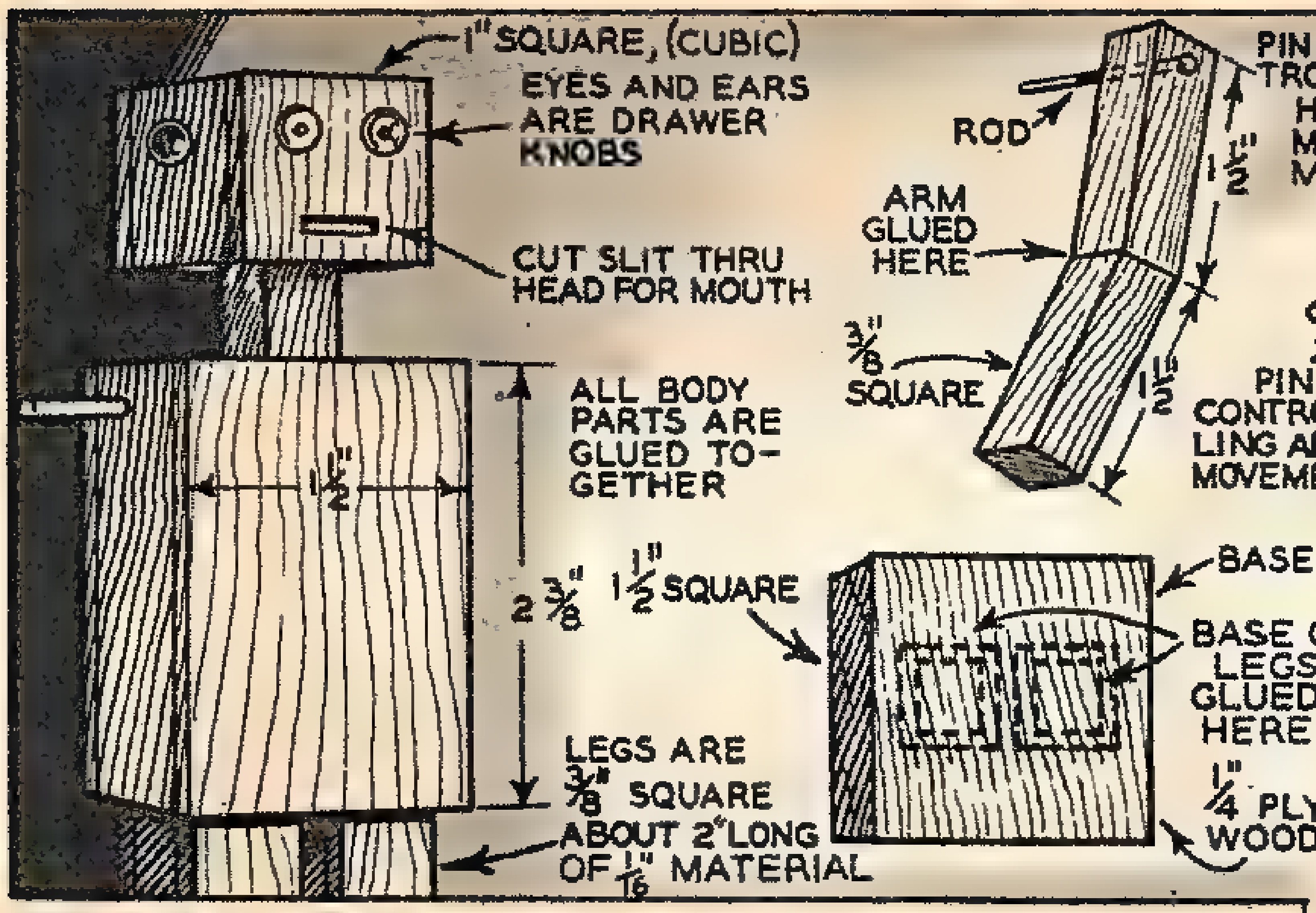
Pour the gelatin slowly over the mold, allowing it to level itself to prevent formation of air pockets. Allow several hours to cool.

Now remove the form, and pull the gelatin away from the model. With room temperatures of less than 50 degrees the mold may be used just as it is, if the plaster is mixed with cold water. In warmer rooms apply two coats of a slow-drying varnish to the inside of the mold.

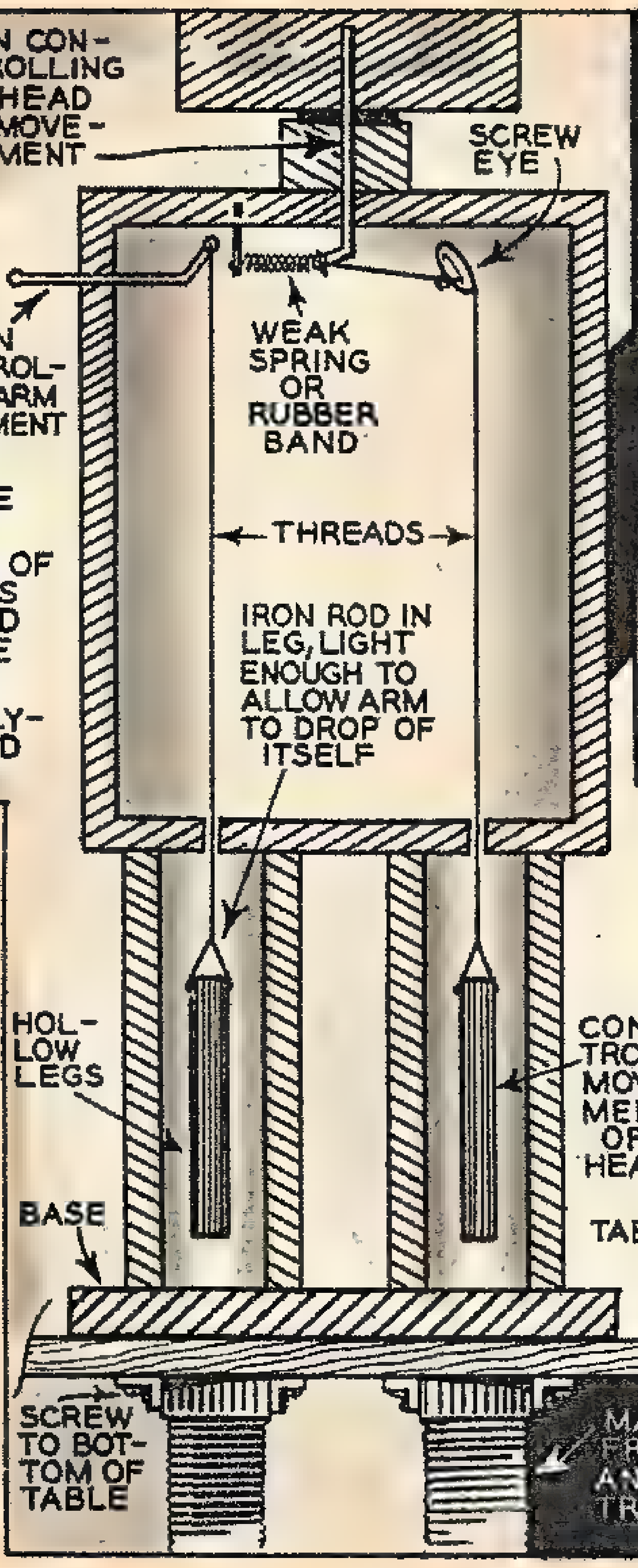
When you are ready to start molding, grease

[*Continued on page* 120]

Midget Mechanical Man Wags Head To Answer Questions


1" SQUARE, (CUBIC)
EYES AND EARS ARE DRAWER KNOBS
CUT SLIT THRU HEAD FOR MOUTH
ALL BODY PARTS ARE GLUED TOGETHER
1½"
2⅜"
LEGS ARE ⅜" SQUARE ABOUT 2" LONG OF 1/16" MATERIAL
ROD
ARM GLUED HERE
⅜" SQUARE
1½"
1½"
1½" SQUARE
BASE
BASE OF LEGS GLUED HERE
¼" PLY-WOOD

Glue together parts of body (above), then shellac, sand down, and coat with aluminum paint. Drill hole in neck for head control wire. Place washer between head and neck.

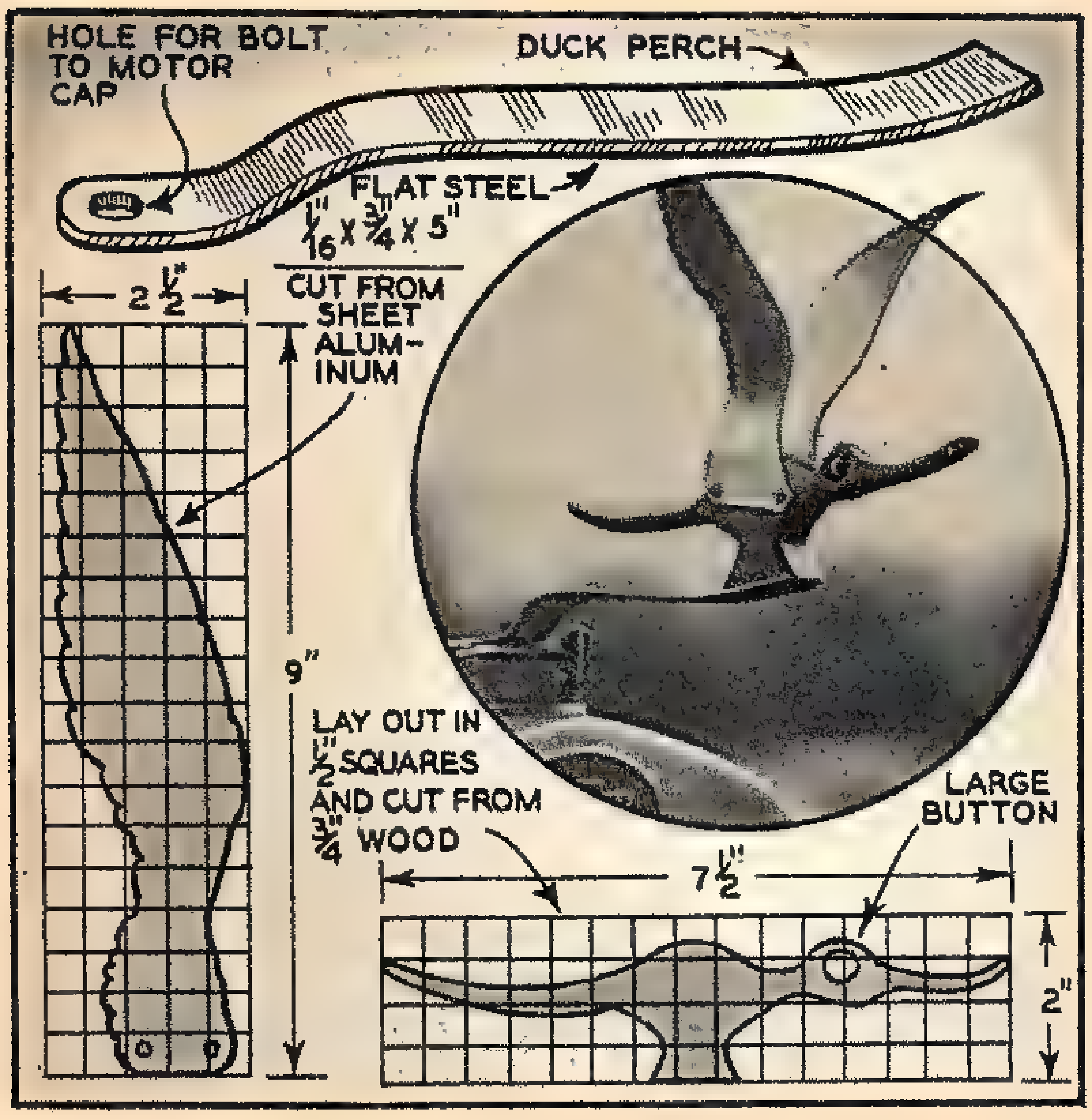

PIN CONTROLLING HEAD MOVEMENT
SCREW EYE
PIN CONTROLLING ARM MOVEMENT
WEAK SPRING OR RUBBER BAND
THREADS
IRON ROD IN LEG, LIGHT ENOUGH TO ALLOW ARM TO DROP OF ITSELF
HOLLOW LEGS
CONTROLS MOVEMENT OF HEAD
BASE
TABLE
SCREW TO BOTTOM OF TABLE
MAGNET-WITH WIRES FROM IT TO BATTERY AND PUSHBUTTON CONTROLS ACTION

With arm upraised in salute, "Doremus" poses for picture. Finish him in aluminum bronze, to give him that much-desired metallic robot complexion. Secret of magnetic personality is exposed in sketches at left.

Radiator Cap Is "Flying Goose"

A LIVELY and amusing ornament for your auto radiator cap is this grotesquely modernistic flying goose design. Suspended on a thin spring steel perch, the bird flaps up and down fascinatingly as the car speeds along.

Transfer the pattern of the body to ¾" white pine and cut out on a band saw or by hand. Sandpaper thoroughly, enamel a glossy black, then insert bright red buttons in the eye sockets. Cut the wings from sheet aluminum, buff to a high polish, then screw to the body. A sharp drill turned slowly will make mounting holes in the length of clock spring used for the perch.


HOLE FOR BOLT TO MOTOR CAP
DUCK PERCH
FLAT STEEL 1/16" x ¾" x 5"
2½"
CUT FROM SHEET ALUMINUM
9"
LAY OUT IN ½" SQUARES AND CUT FROM ¾" WOOD
LARGE BUTTON
7½"
2"

Above squares make transferring of goose patterns to working materials easy. Stiff clock spring may be used for perch.

A LITTLE wood, a dash of aluminum paint, and a lot of concealed hocus-pocus, assembled as shown above, make *Doremus*—a vest pocket edition of that strange, awe-inspiring scientific oddity, The Mechanical Man. He can count to eleven, wag his head in answer to any question put him, and even whirl his one free arm around, windmill fashion.

Doremus operates by means of electro magnets kept out of sight, under the table top or hidden in the base on which the robot can be mounted. The magnets can be taken from a door bell and connected to batteries and separates switches mounted under the rim of the table. It will be necessary to experiment with the counterbalances inside the legs to get them just the right weight and distance from the magnets to turn the arm and head.

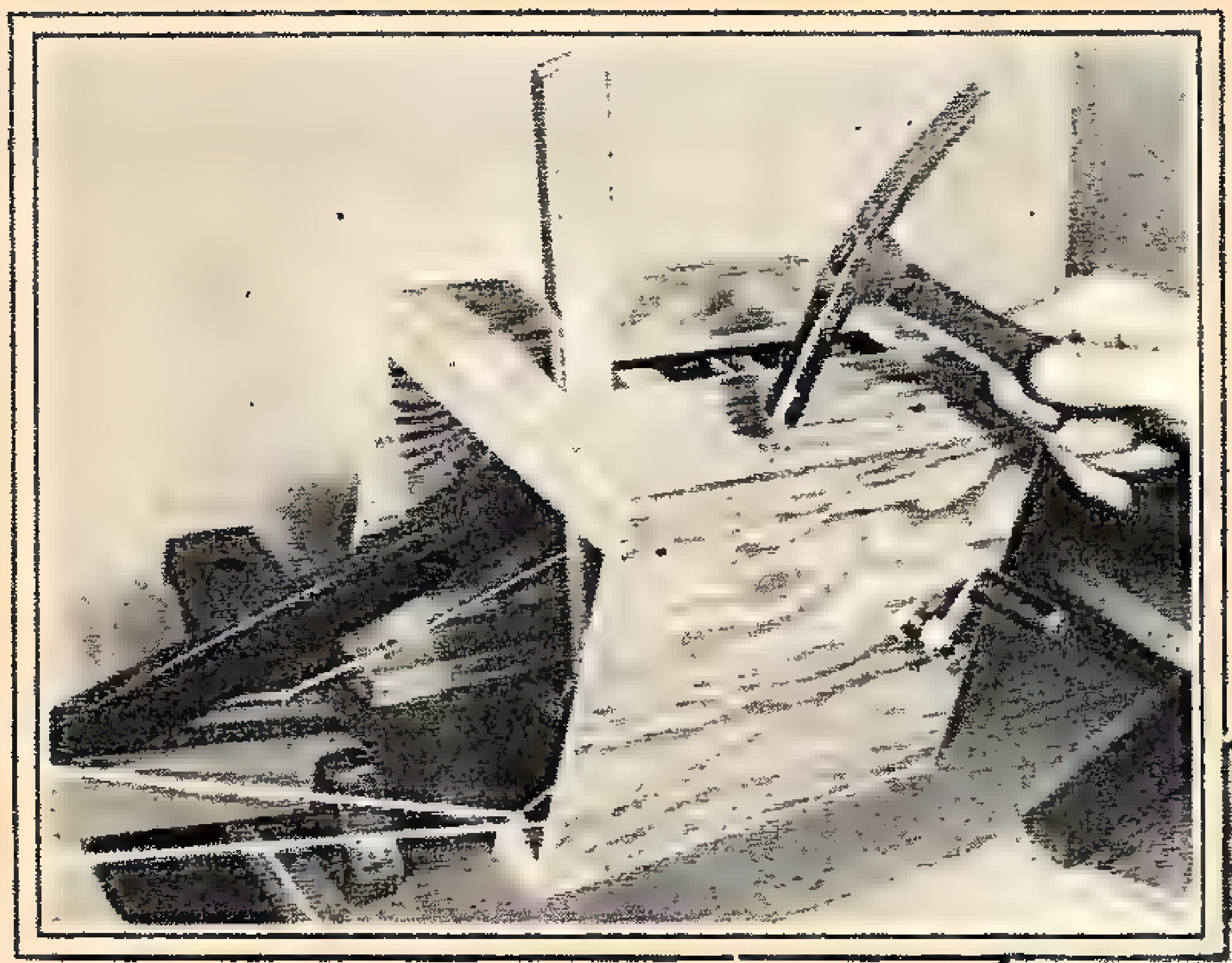
The short lengths of iron rod are suspended with waxed threads from levers in the hollow trunk of the figure. That attached to the arm lever must be light enough to allow the arm to fall of its own accord. A small spring returns the head to normal position when the magnet operating it releases.

Make pin pricks in the top of the table to indicate where the magnets are located.

Boy-Power "STEAM SHOVEL"

Shoveling sand in summer, snow in winter, this boy-size "steam shovel" is a year 'round source of fun for the mechanically inclined youngster who craves action.

by RALPH T. MOORE

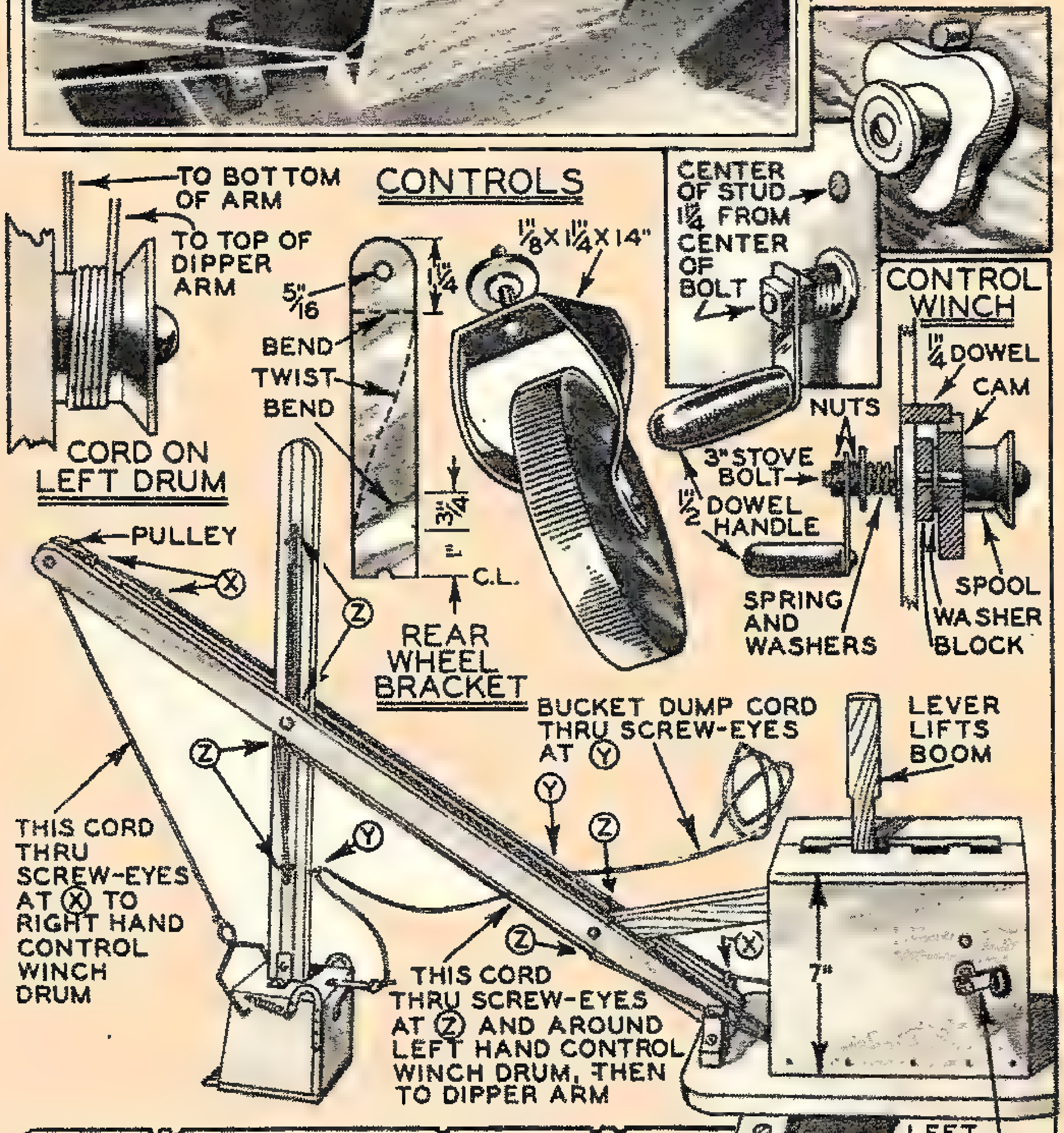


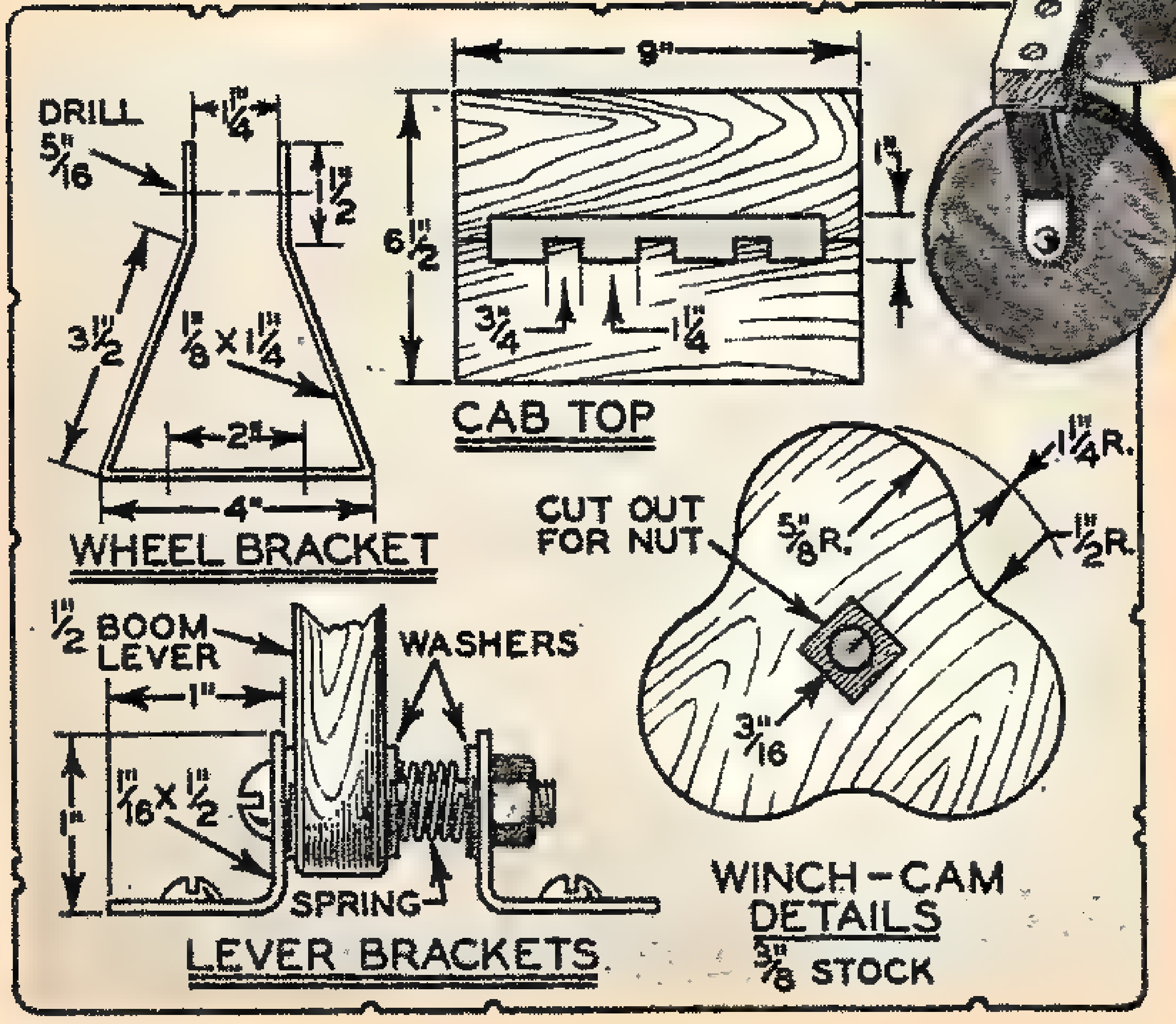
LIKE the giant steam shovels used in cutting out highways, this boy-powered shovel digs into miniature sand mountains, pivots about realistically to release its bucketful of earth over a waiting toy truck or railroad gondola car. Hands and feet of youthful operators must move in coordination as boom and dipper are maneuvered back into position for another "bite" at the back-yard sand pile.

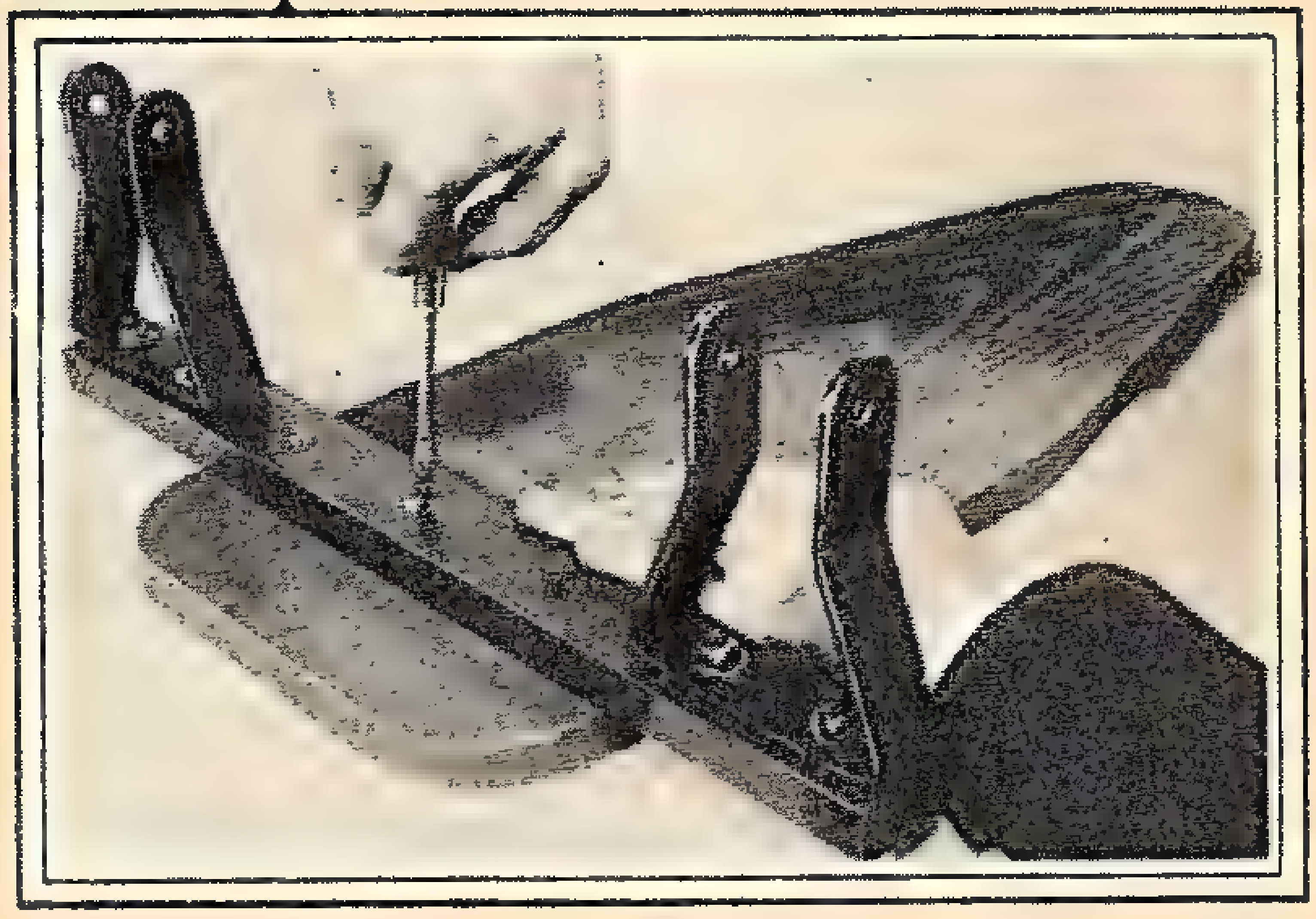
Winter brings no period of rest to this sturdy shovel. Watch the one-thousandth cubic yard capacity dipper scoop up snow from the sidewalk, pile it neatly to one side of the path.

The position of the boom is controlled by the lever at the top of the cab, and may be set at four different heights. The sliding movement of the dipper inside the boom is taken care of by the left control crank, and the forward motion of the bucket by the right crank. Turning is done with the feet, the rear wheel being pivoted.

Plywood, a few scraps of soft


TO BOTTOM OF ARM
TO TOP OF DIPPER ARM
CORD ON LEFT DRUM
CONTROLS
5/16
1 1/4
BEND
TWIST
BEND
3/4
C.L.
REAR WHEEL BRACKET
1/8 x 1 1/4 x 14"
CENTER OF STUD 1 1/4 FROM CENTER OF BOLT
CONTROL WINCH
1/4 DOWEL
CAM
NUTS
3" STOVE BOLT
1/2 DOWEL HANDLE
SPRING AND WASHERS
SPOOL
WASHER
BLOCK
PULLEY
X
Z
Y
BUCKET DUMP CORD THRU SCREW-EYES AT Y
LEVER LIFTS BOOM
THIS CORD THRU SCREW-EYES AT X TO RIGHT HAND CONTROL WINCH DRUM
THIS CORD THRU SCREW-EYES AT Z AND AROUND LEFT HAND CONTROL WINCH DRUM, THEN TO DIPPER ARM
7"
LEFT CONTROL


DRILL 5/16
1/4"
1 1/2
3 1/2
1/8 x 1 1/4
2"
4"
WHEEL BRACKET
9"
6 1/2
1"
3/4
1 1/4
CAB TOP
1 1/4"R.
CUT OUT FOR NUT
5/8"R.
1/2"R.
3/16
WINCH-CAM DETAILS
5/8" STOCK
1/2 BOOM LEVER
1"
WASHERS
1/16 x 1/2
1"
SPRING
LEVER BRACKETS



Details of construction and assembly of steam shovel are covered in above sketches and photos. Control winch, on right side of cab, has locking cam which holds up the dipper.

Moves Miniature MOUNTAINS

pine, some pieces of sheet metal, and a few odds and ends of wire and bolts are the only materials needed in constructing this shovel.

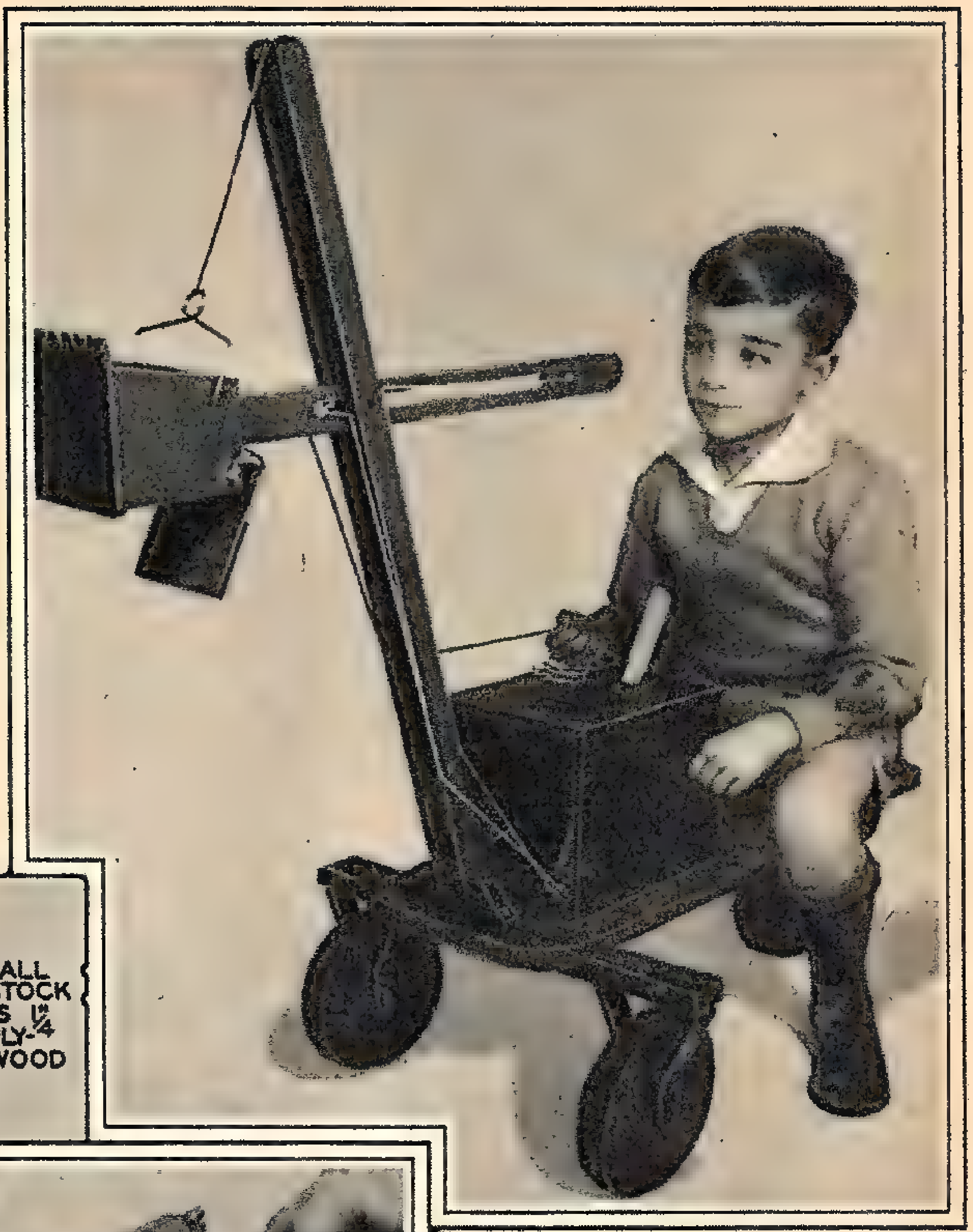
Build the dipper or bucket first, assembling the plywood sides with glue and brads. Cut two hinges for the door from 20-gauge sheet metal, bending as shown in the sketches. The dump lever is cut from the same material, and fastened to the dipper door with small wood screws.

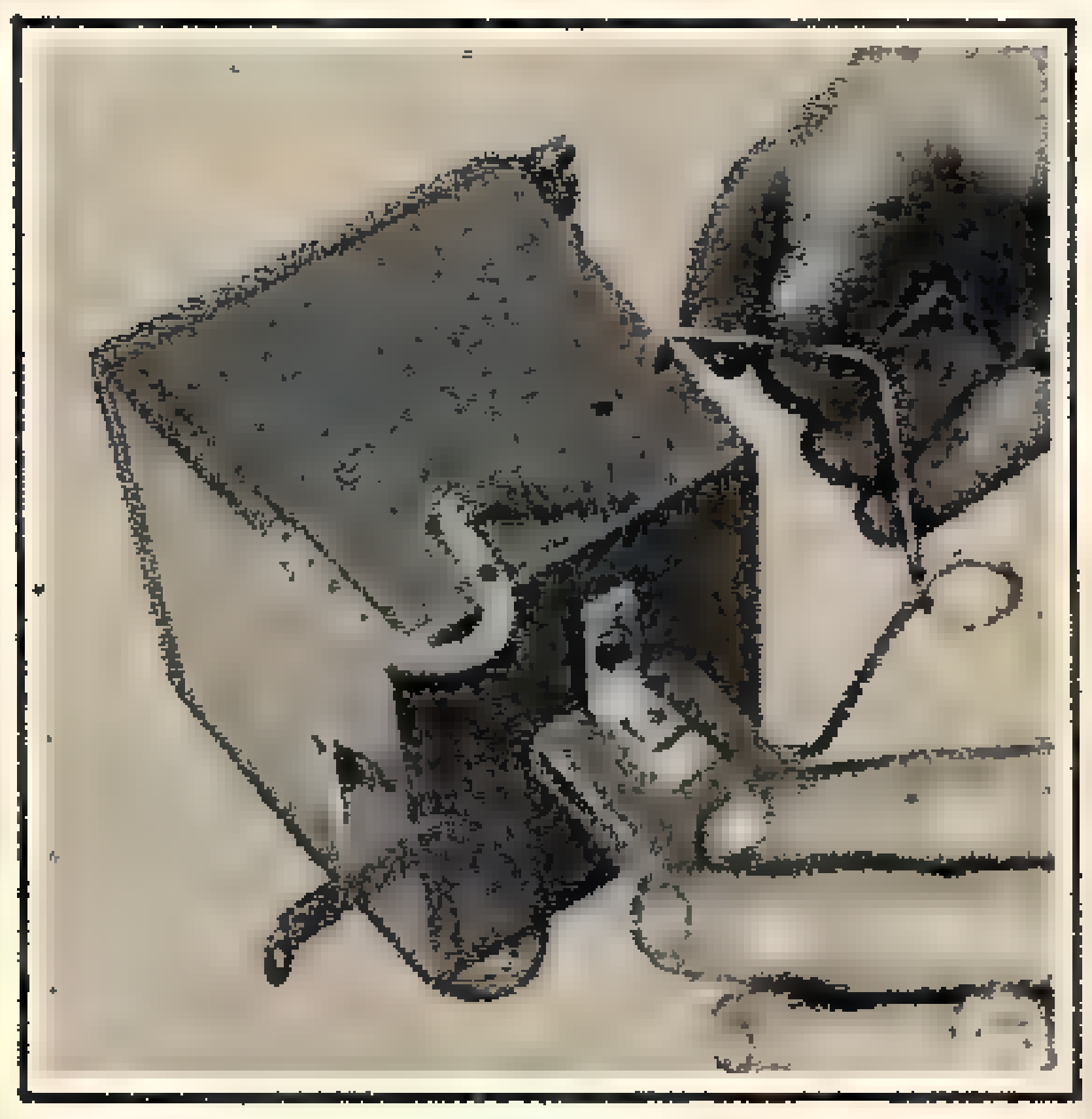
A small spring fastened to the dipper keeps sand from forcing open the bucket door. An 11″ length of stiff wire is bent to form the dipper bail; this snaps into place.

Saw out the base board, the seat, and the front wheel bracket arm from 1″ stock, sanding the edges and then drilling as shown. The wheels may either be cut from 1¼″ stock on the band saw or turned out on a lathe. Wheel brackets are formed from ⅛″ thick strap iron.

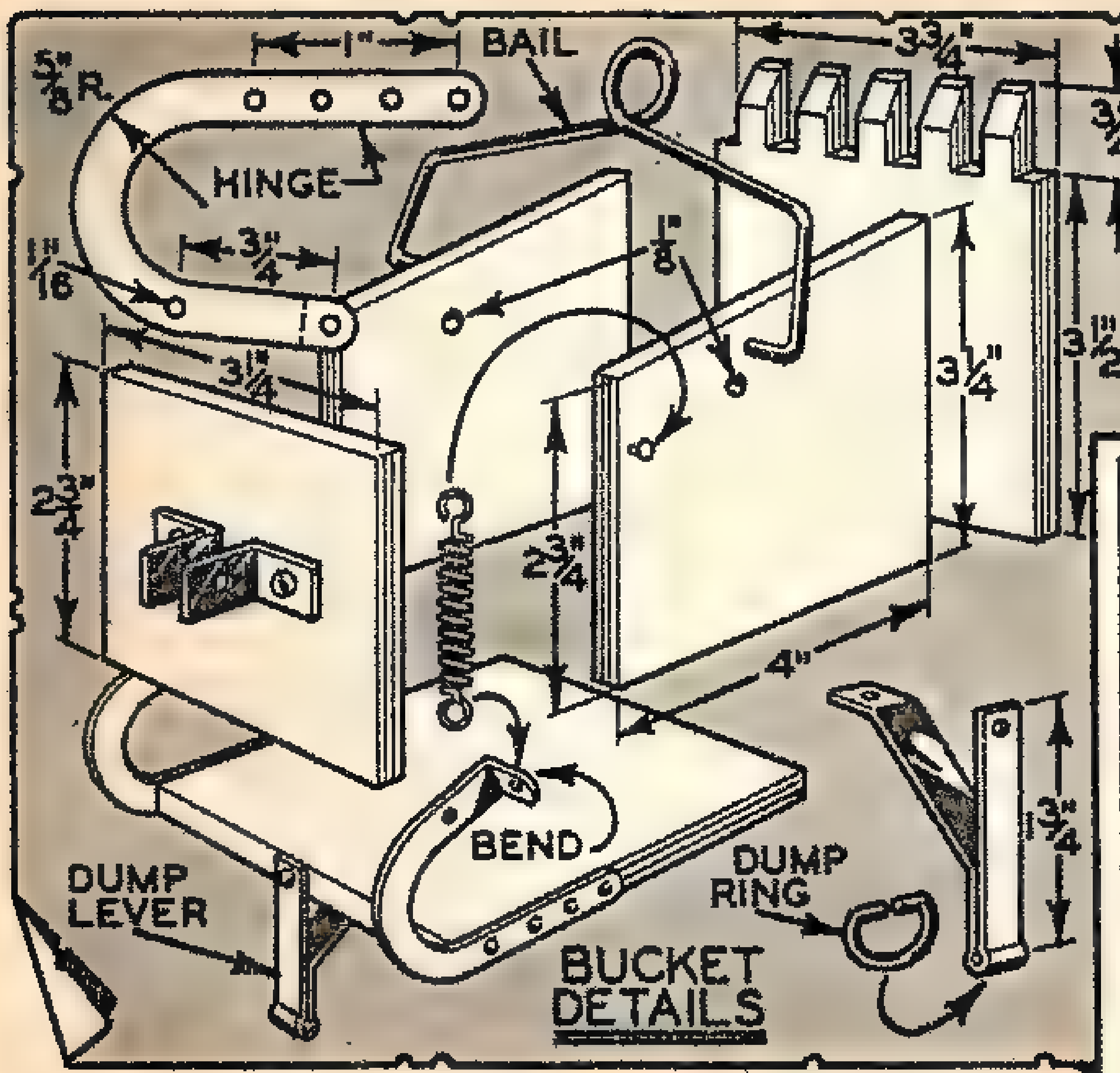
Use strong chalk line in rigging the shovel. Small screw eyes serve as guide pulleys.

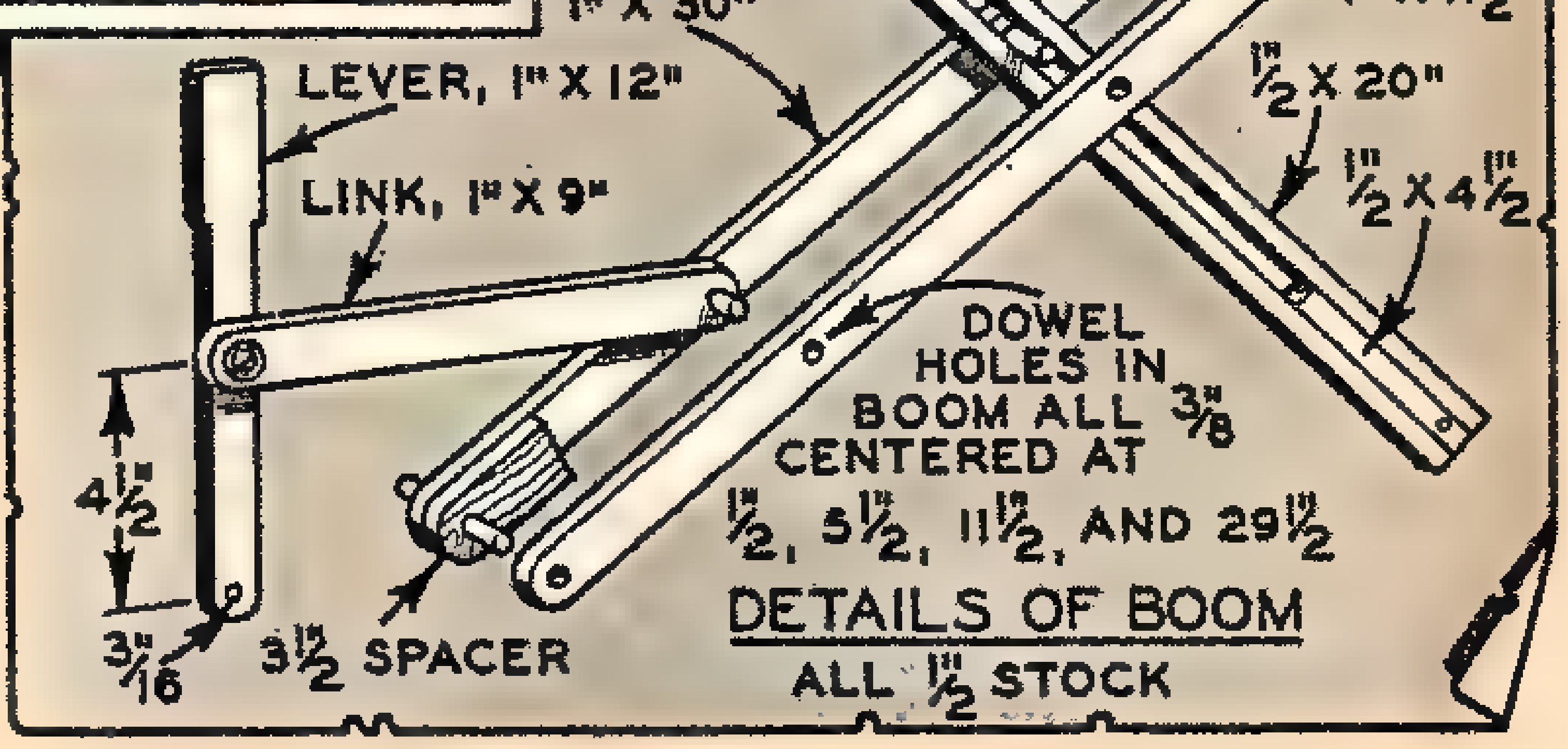
Two coats of paint complete the shovel.

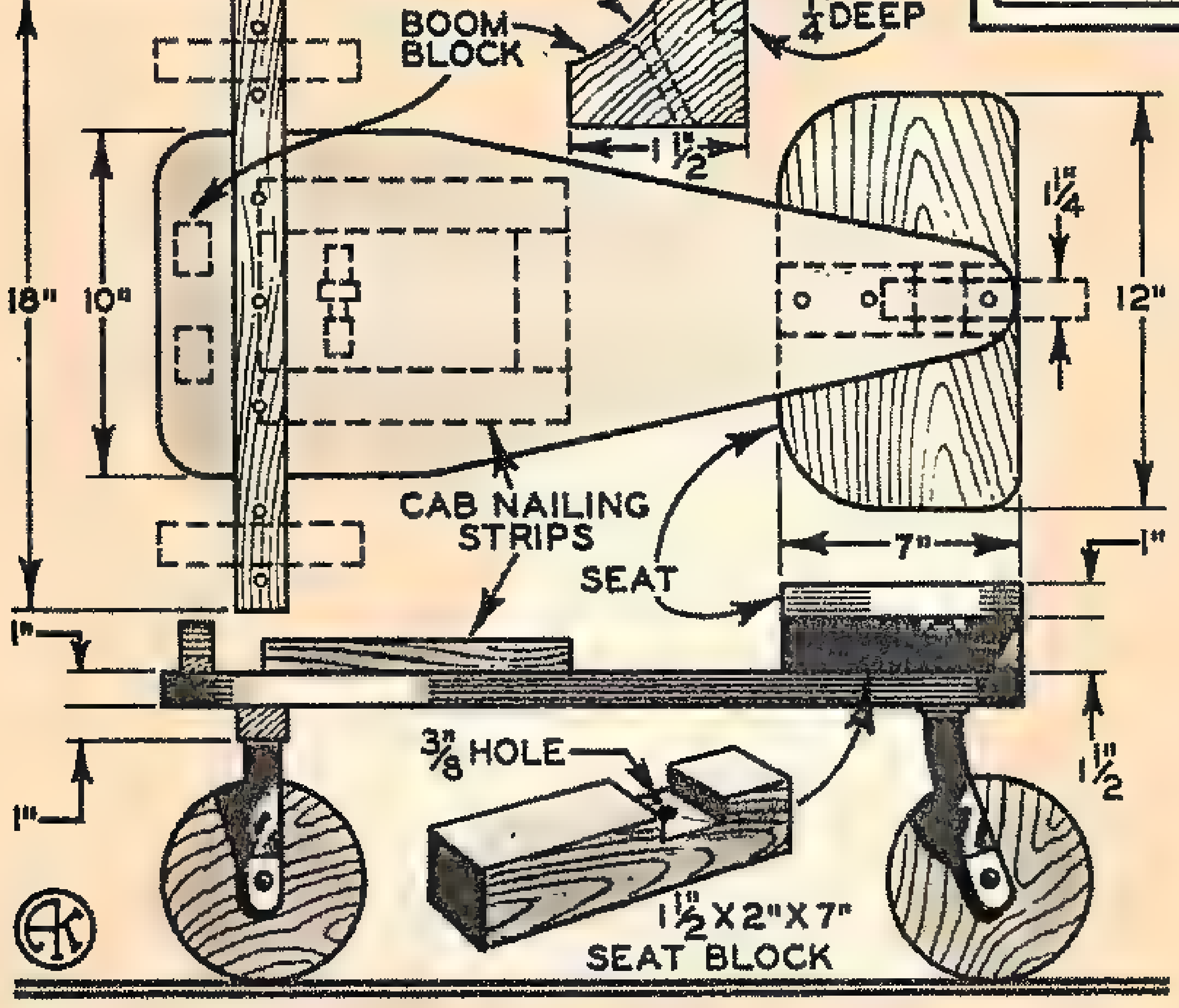




Here's how the completed shovel will appear. Bucket release cord is held in hand. Boom is at highest position here.

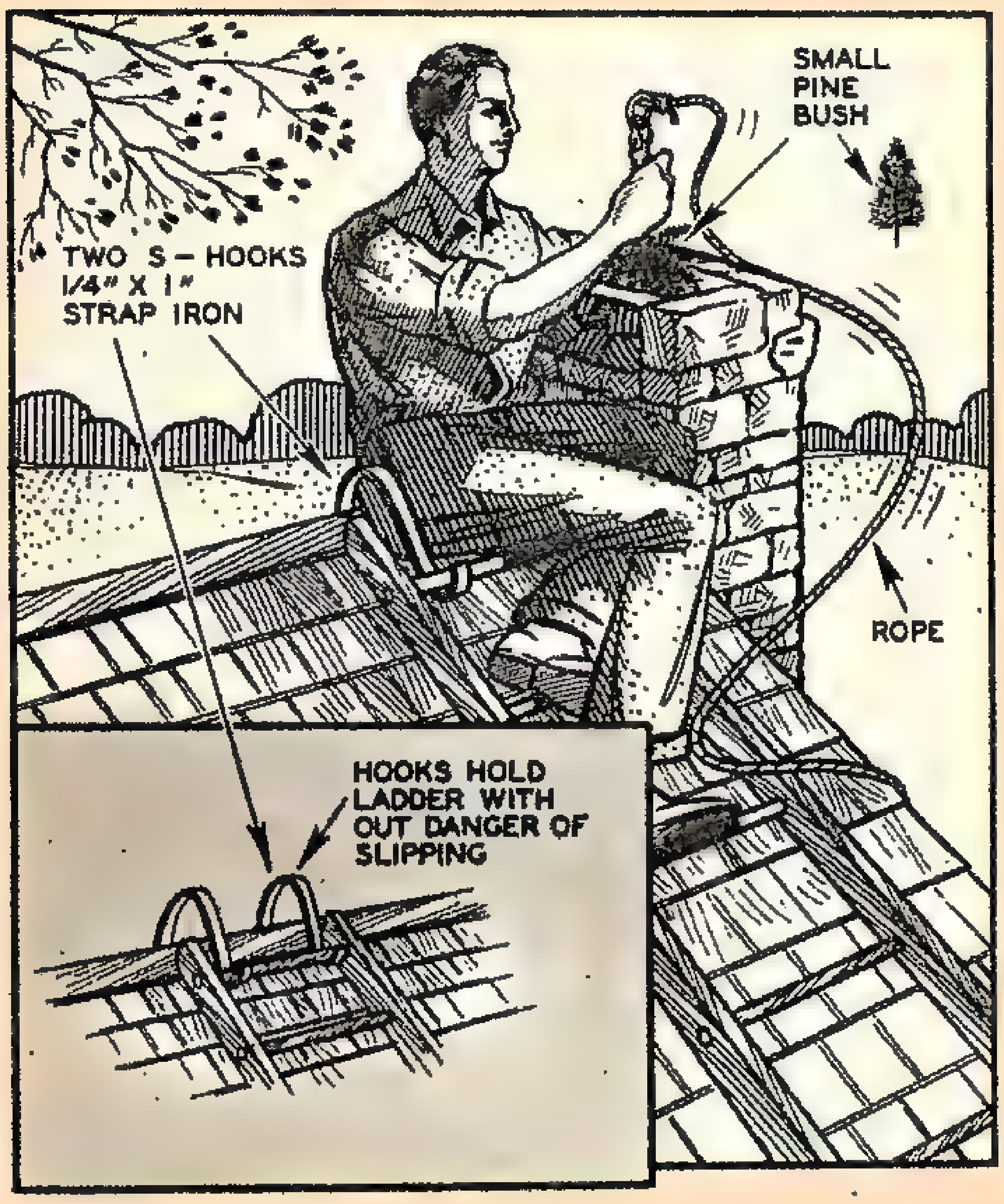

5/8" R.
1"
BAIL
3 3/4"
3/4"
ALL STOCK IS 1/4" PLY-WOOD
HINGE
1/16"
3/4"
1/8"
3 1/4"
3 1/4"
3 1/2"
2 3/4"
2 3/4"
4"
1 3/4"
BEND
DUMP LEVER
DUMP RING
BUCKET DETAILS


PULLEY OF SPOOL ENDS ON 3/8 DOWEL
1/2 X 4 1/2
1" X 30"
1" X 1 1/2
LEVER, 1" X 12"
1/2 X 20"
LINK, 1" X 9"
1/2 X 4 1/2
DOWEL HOLES IN BOOM ALL 3/8 CENTERED AT 1/2, 5 1/2, 11 1/2, AND 29 1/2
4 1/2
3/16
3 1/2 SPACER
DETAILS OF BOOM
ALL 1/2 STOCK


1 1/2
1/8 DRILL
3/8" HOLE 1/4" DEEP
BOOM BLOCK
1 1/2"
1 1/4
18"
10"
12"
CAB NAILING STRIPS
SEAT
7"
1"
1"
1 1/2
1"
3/8 HOLE
1 1/2 X 2" X 7"
SEAT BLOCK
EK

Assembly of bucket, base, and boom arm are covered above. Red, black, and grey is suggested combination for the shovel.

SEASONAL HOME SUGGESTIONS

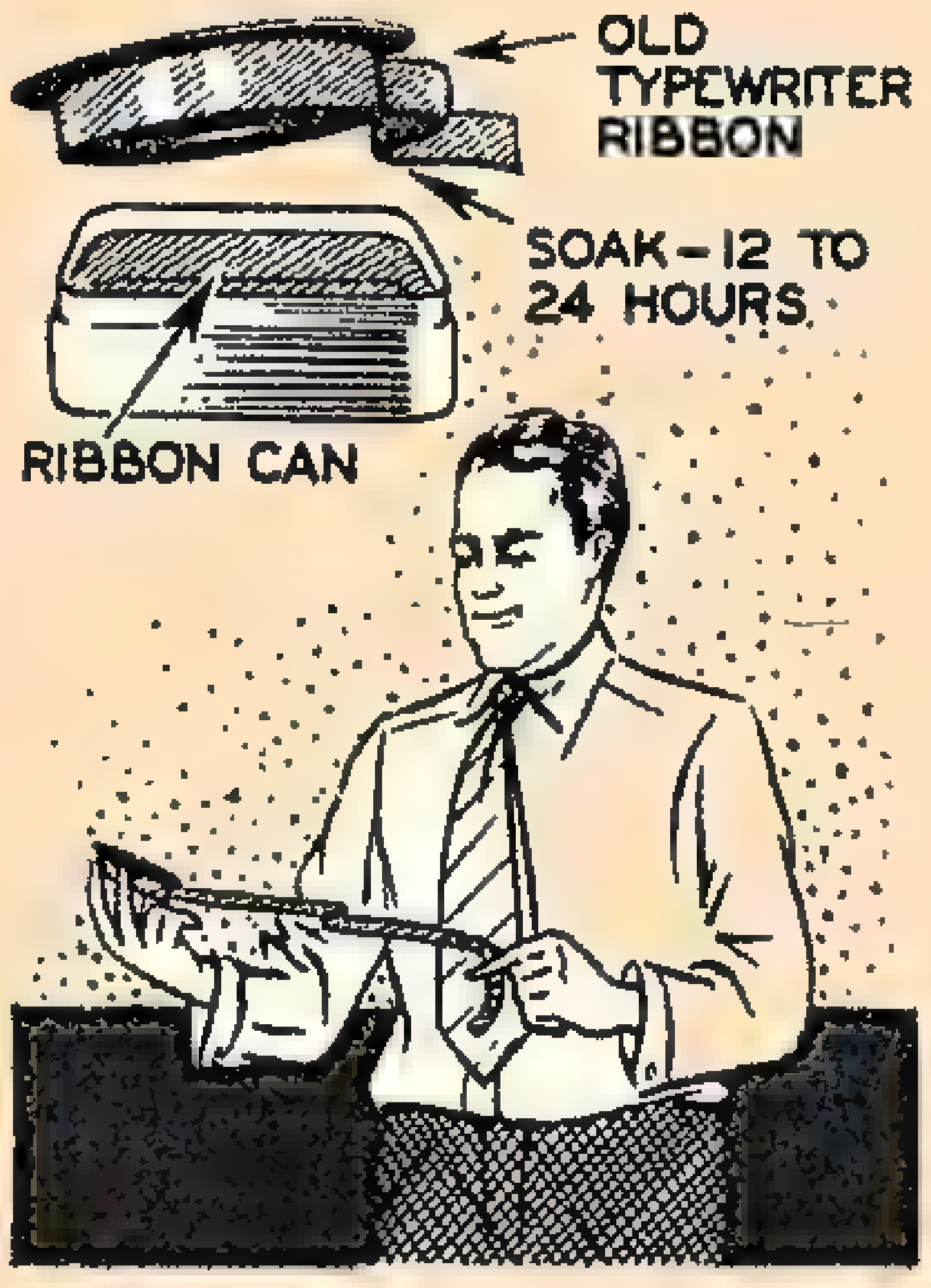

SMALL PINE BUSH
TWO S-HOOKS 1/4" X 1" STRAP IRON
ROPE
HOOKS HOLD LADDER WITH OUT DANGER OF SLIPPING

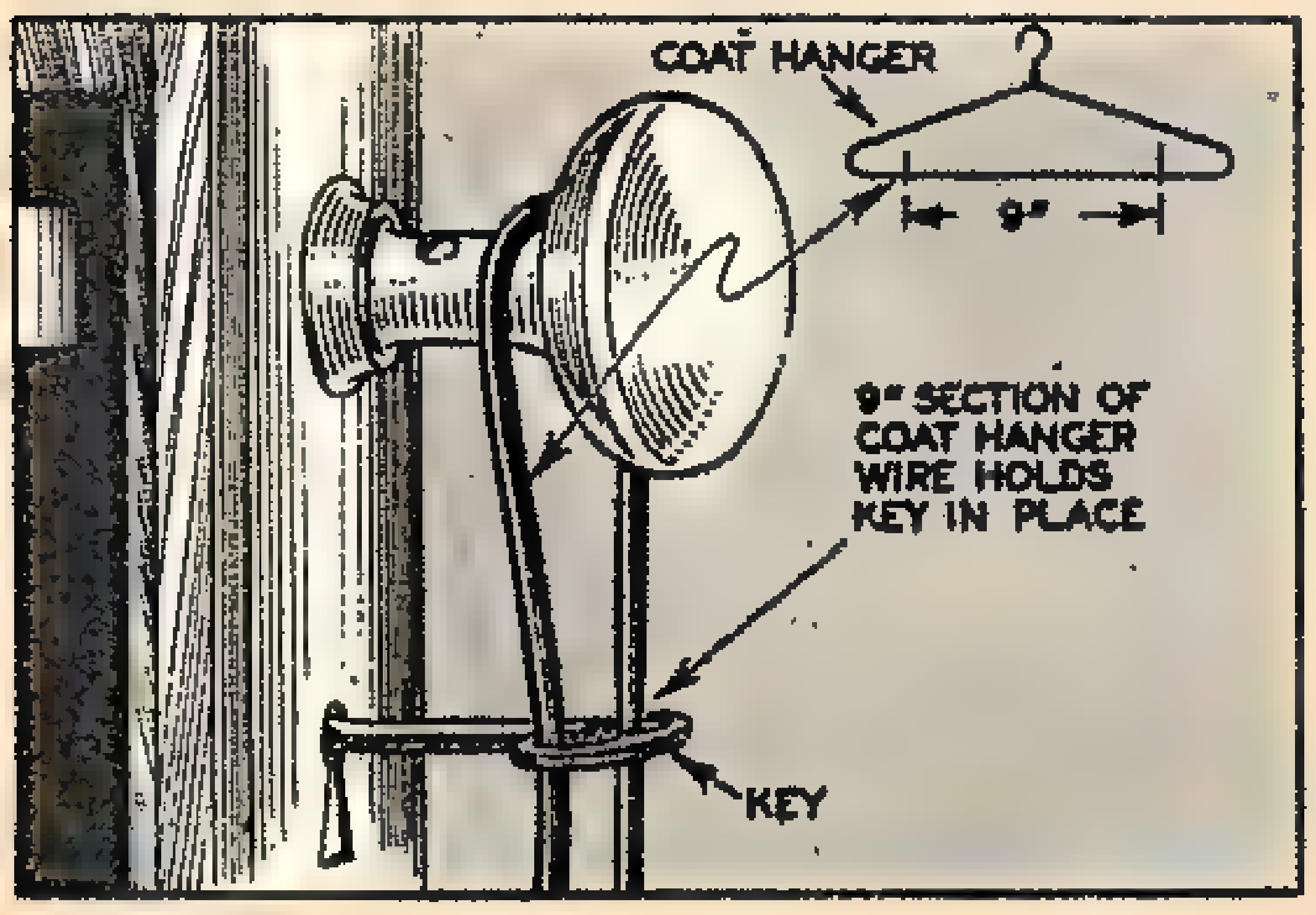
Clean Chimney With Small Pine Bush

THE annual chimney cleaning is often neglected by home owners because of lack of special equipment. This need not deter you from removing the winter's accumulation of soot, for a small pine bush dropped up and down the chimney a few times at the end of a rope will do the trick. The bush should fit snugly when pushed, tip first, down the chimney. It may be necessary to weight the bush with stones if it jams before reaching the bottom. A safe ladder hook for roof work is also shown.—J. Gilbert.

Glycerine Renews Typewriter Ribbons

BY APPLYING a few drops of glycerine from time to time, typewriter ribbons can be re-inked and used over and over again. Simply wind the ribbon onto an old spool having the bottom removed, and set into a metal can with the ribbon ends touching the bottom. Place 3 or 4 drops of glycerine in the can, then close tightly for one day. The glycerine filters evenly through the ribbon by osmosis.—F. Bunce.


OLD TYPEWRITER RIBBON
SOAK-12 TO 24 HOURS
RIBBON CAN

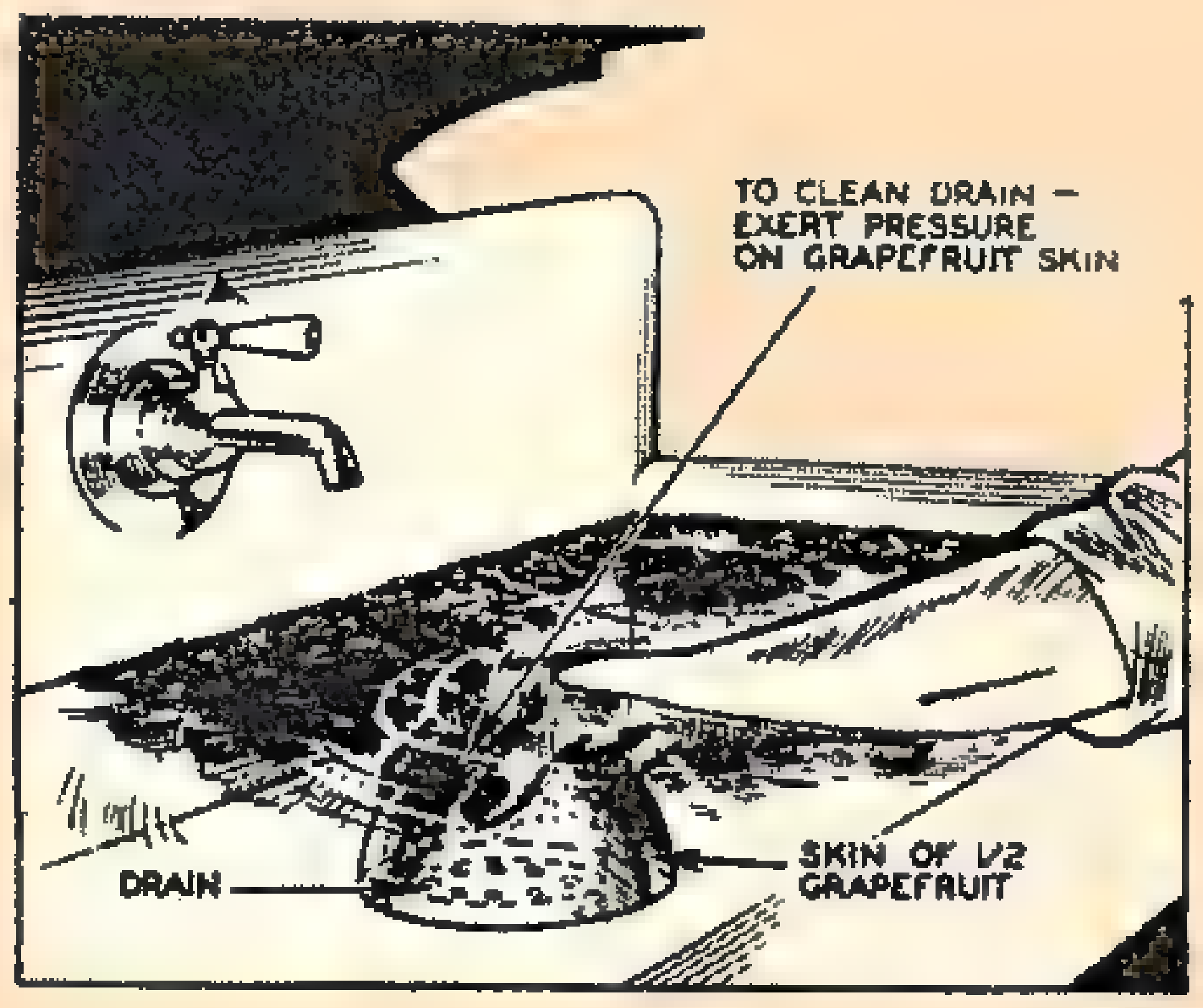

COAT HANGER
9"
9" SECTION OF COAT HANGER WIRE HOLDS KEY IN PLACE
KEY

Burglar-Proof Door Lock

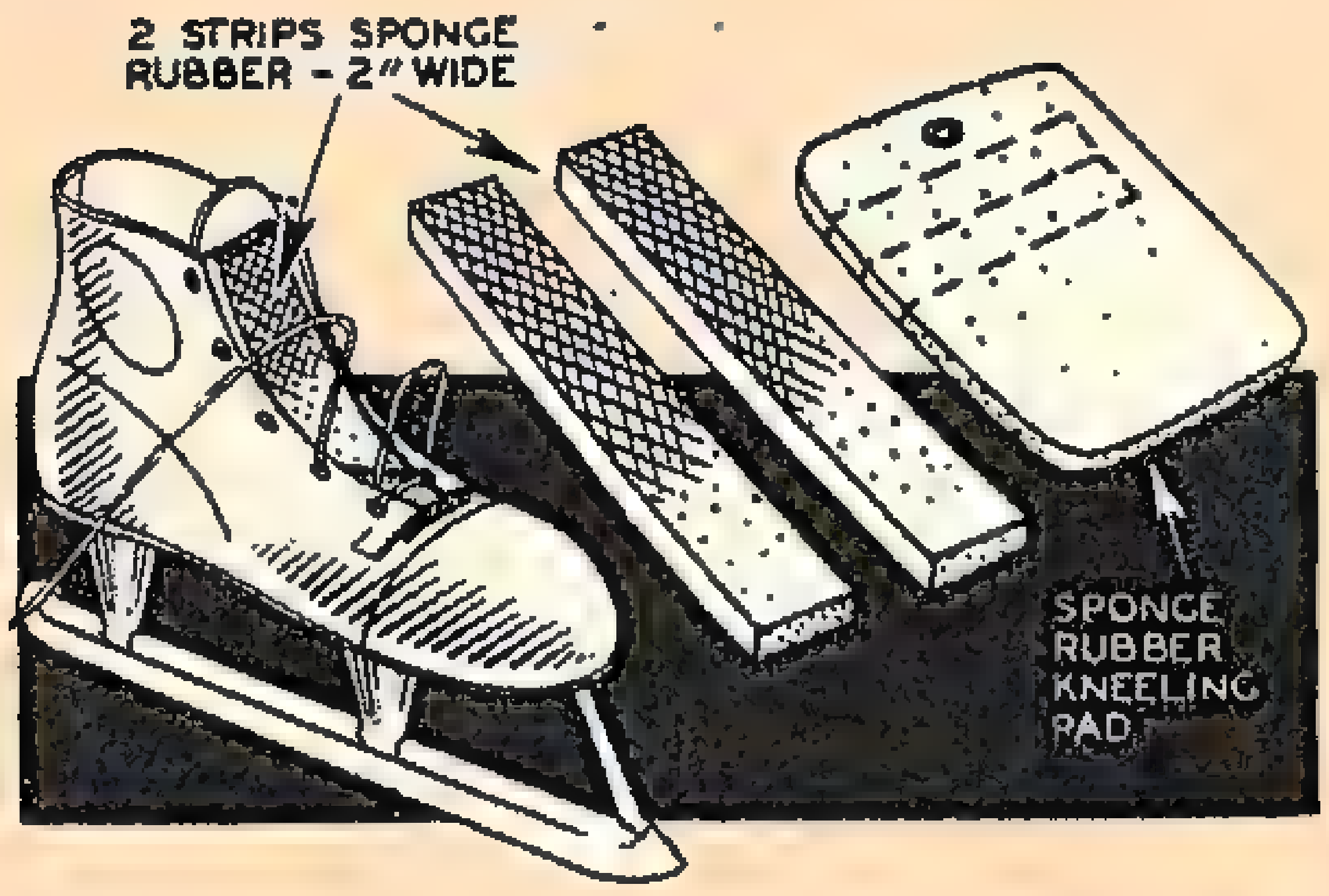
SIDE or back doors of the home, usually locked from the inside, are easily made burglar-proof. Lock the door, leaving the key in the lock. Now bend about a nine-inch length of stiff wire, such as that used for coat hangers, into a hairpin loop which can be slipped over the door knob and through the hole in the key handle. This prevents anyone from pushing the key out from the other side.—Glenn Godwin.

Grapefruit Skin Opens Clogged Sink Drain

WHEN the kitchen sink is clogged up, and no plumber's force cup is handy, a half grapefruit skin will serve just as well. Exert rapid pressure on the skin after placing it over the drain opening, just as when using a rubber cup. The pressure forces air through the drain.—A. Williamson.

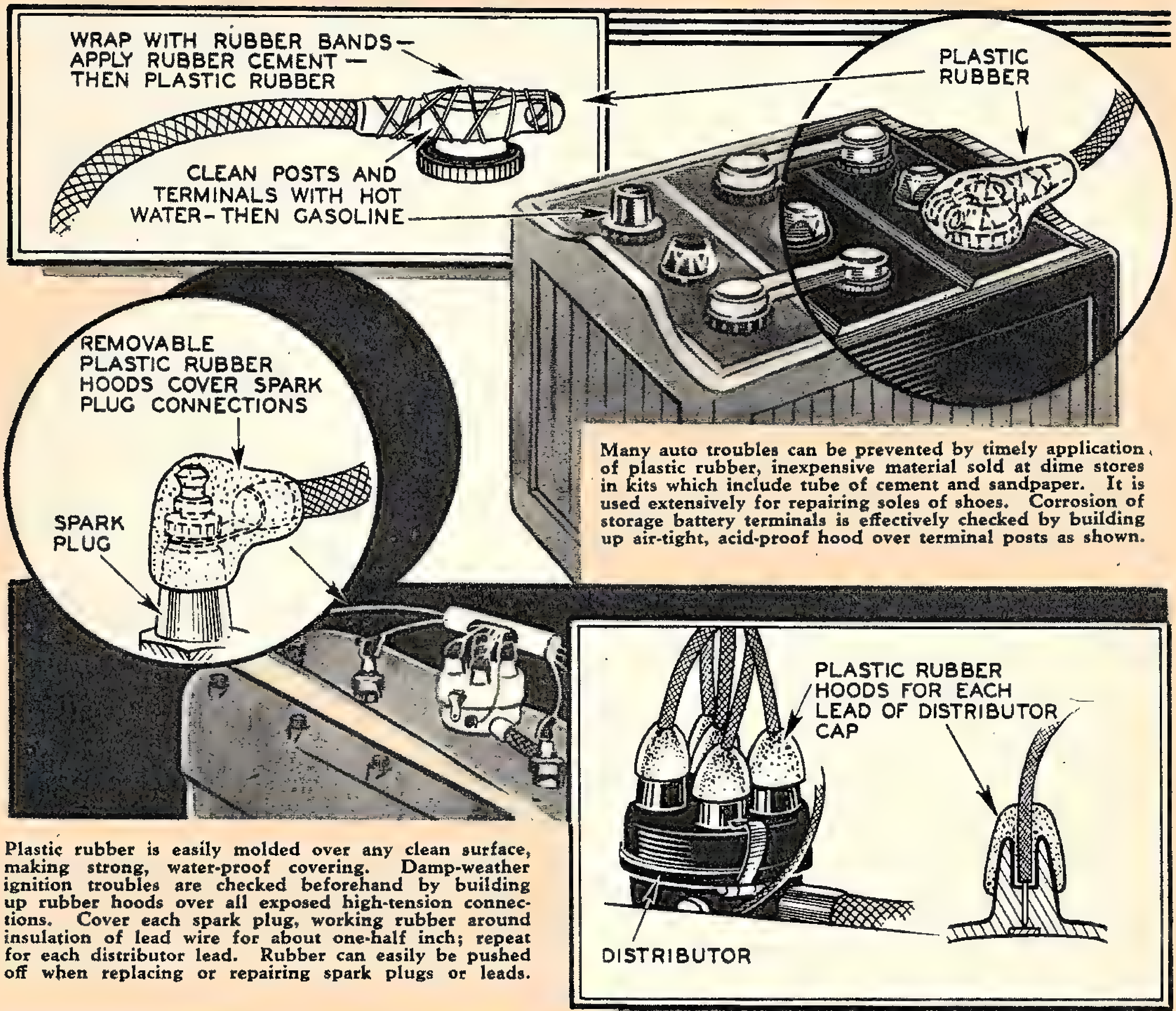

TO CLEAN DRAIN – EXERT PRESSURE ON GRAPEFRUIT SKIN
DRAIN
SKIN OF 1/2 GRAPEFRUIT

Put Rubber Pads in Skate Shoes


2 STRIPS SPONGE RUBBER - 2" WIDE
SPONGE RUBBER KNEELING PAD

SKATING shoes can be made more comfortable by placing a strip of sponge rubber under the laces, but over the tongue of each. Shoes can be laced tighter, yet there will be no cutting into the ankle. Weak ankles are better supported when the pads are used. Use 2" wide strips cut from kneeling pads sold at dime stores.—Chester Sullivan.

Make AUTO REPAIRS with Plastic RUBBER

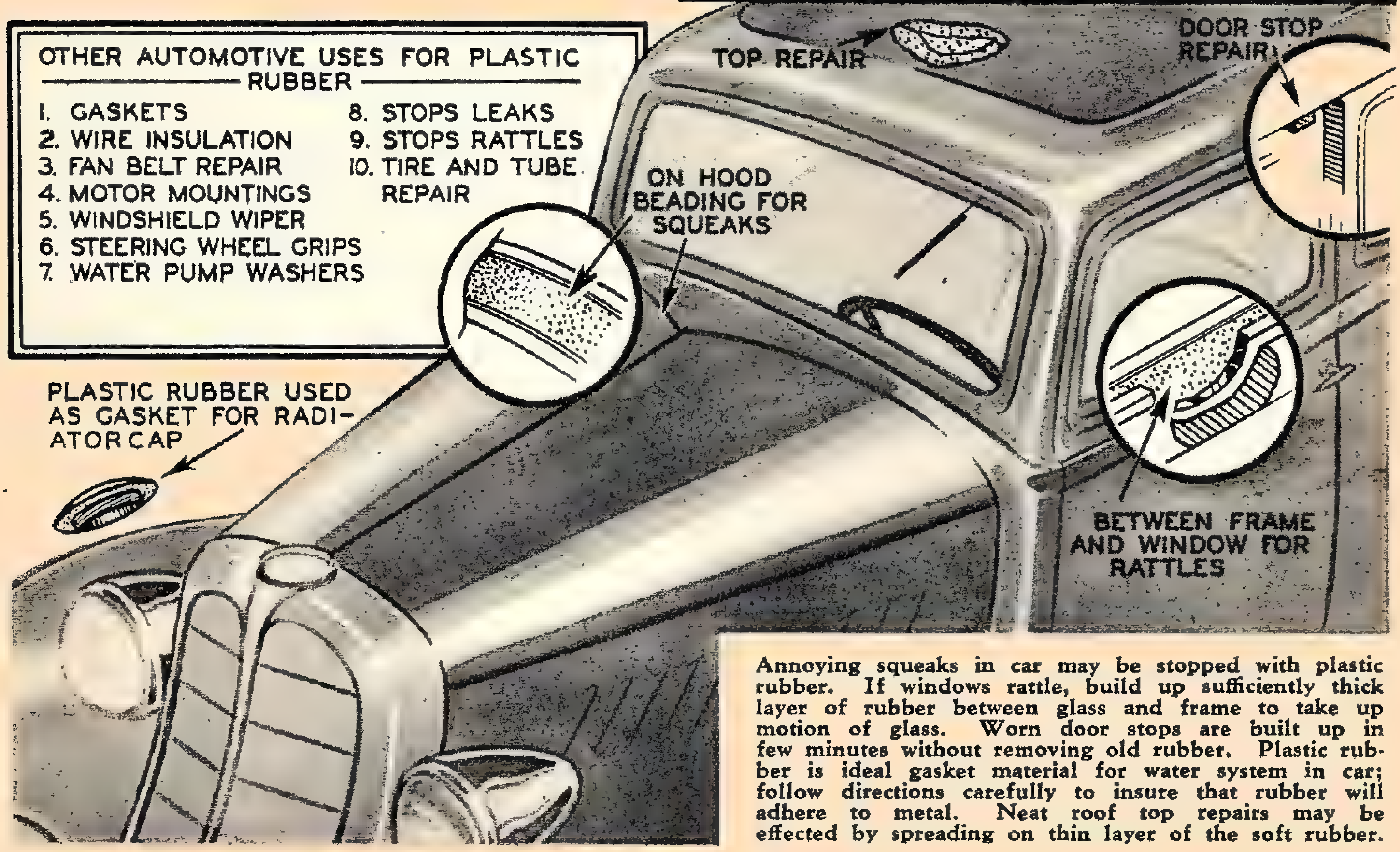

WRAP WITH RUBBER BANDS—
APPLY RUBBER CEMENT —
THEN PLASTIC RUBBER
CLEAN POSTS AND
TERMINALS WITH HOT
WATER-THEN GASOLINE
PLASTIC
RUBBER
REMOVABLE
PLASTIC RUBBER
HOODS COVER SPARK
PLUG CONNECTIONS
SPARK
PLUG
PLASTIC RUBBER
HOODS FOR EACH
LEAD OF DISTRIBUTOR
CAP
DISTRIBUTOR

Many auto troubles can be prevented by timely application of plastic rubber, inexpensive material sold at dime stores in kits which include tube of cement and sandpaper. It is used extensively for repairing soles of shoes. Corrosion of storage battery terminals is effectively checked by building up air-tight, acid-proof hood over terminal posts as shown.

Plastic rubber is easily molded over any clean surface, making strong, water-proof covering. Damp-weather ignition troubles are checked beforehand by building up rubber hoods over all exposed high-tension connections. Cover each spark plug, working rubber around insulation of lead wire for about one-half inch; repeat for each distributor lead. Rubber can easily be pushed off when replacing or repairing spark plugs or leads.

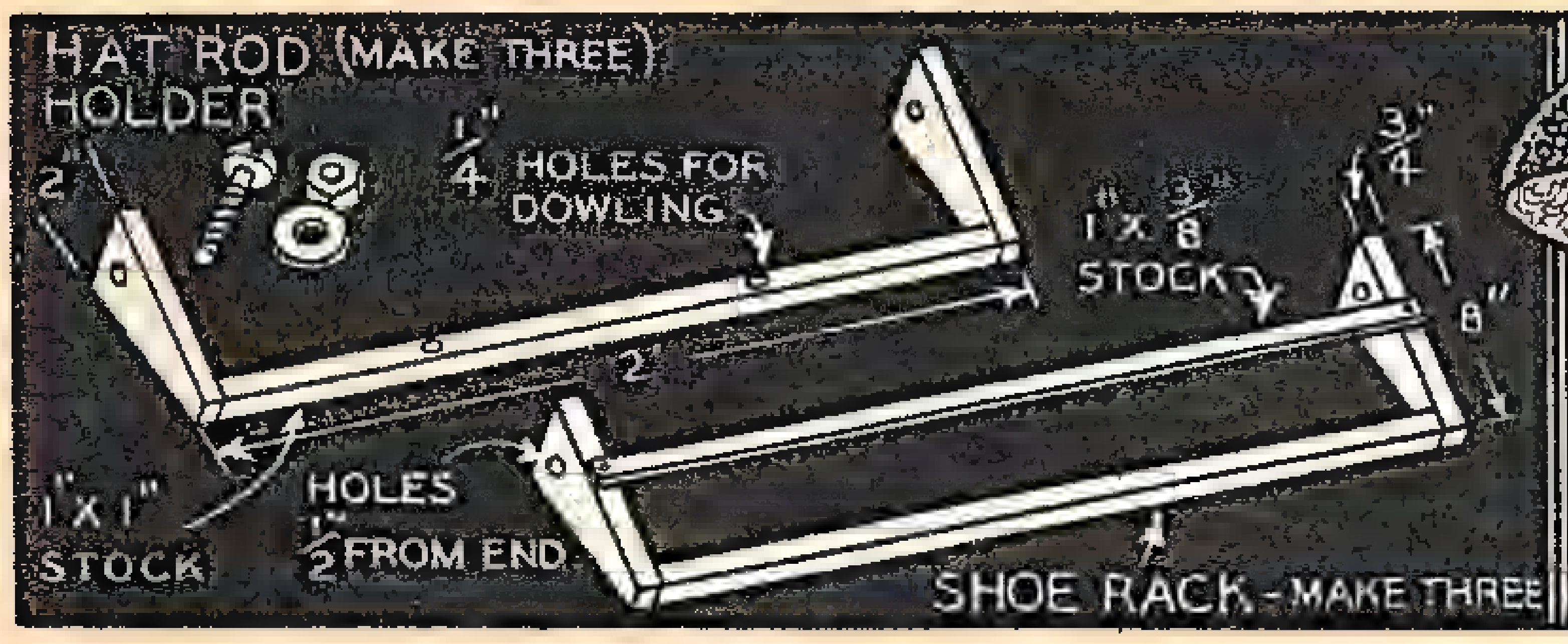
OTHER AUTOMOTIVE USES FOR PLASTIC RUBBER

1. GASKETS
2. WIRE INSULATION
3. FAN BELT REPAIR
4. MOTOR MOUNTINGS
5. WINDSHIELD WIPER
6. STEERING WHEEL GRIPS
7. WATER PUMP WASHERS
8. STOPS LEAKS
9. STOPS RATTLES
10. TIRE AND TUBE REPAIR

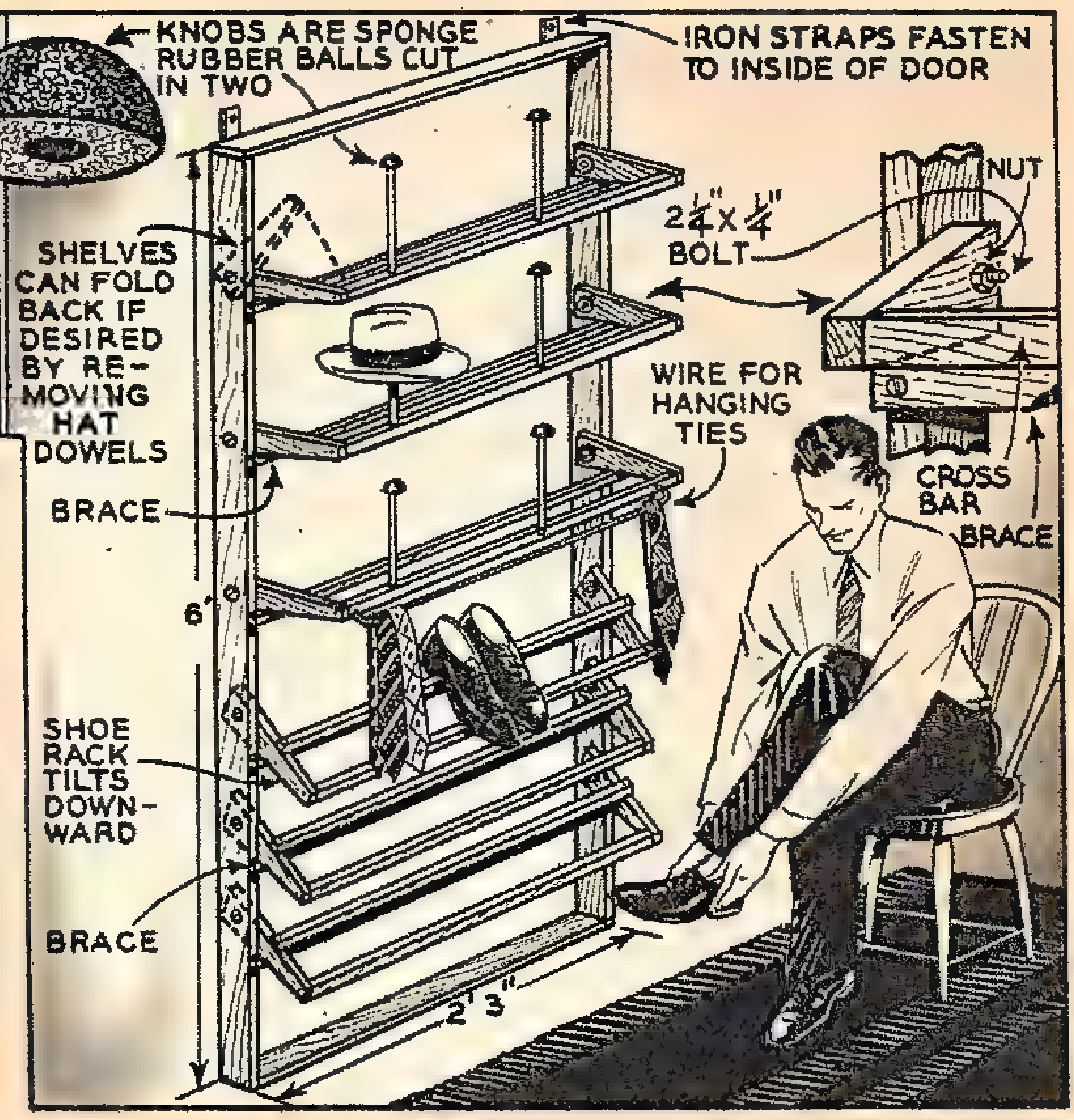

TOP REPAIR
DOOR STOP
REPAIR
ON HOOD
BEADING FOR
SQUEAKS
PLASTIC RUBBER USED
AS GASKET FOR RADIATOR CAP
BETWEEN FRAME
AND WINDOW FOR
RATTLES

Annoying squeaks in car may be stopped with plastic rubber. If windows rattle, build up sufficiently thick layer of rubber between glass and frame to take up motion of glass. Worn door stops are built up in few minutes without removing old rubber. Plastic rubber is ideal gasket material for water system in car; follow directions carefully to insure that rubber will adhere to metal. Neat roof top repairs may be effected by spreading on thin layer of the soft rubber.

Rack Hangs Inside Closet Door to Increase Storage Space


HAT ROD (MAKE THREE)
HOLDER
2"
1/4" HOLES FOR DOWLING
3/4"
1" x 3/8" STOCK
8"
2'
1"x1" STOCK
HOLES 1/2" FROM END
SHOE RACK-MAKE THREE

Above—Details of the hat and shoe racks. Right—Starting from the top, the hat racks are placed one foot apart. The shoe racks at the bottom are inserted at eight-inch intervals. The bolts holding the racks to the frame should be loose so that the individual racks may be folded when not in use.


KNOBS ARE SPONGE RUBBER BALLS CUT IN TWO
IRON STRAPS FASTEN TO INSIDE OF DOOR
NUT
2 1/4" x 1/4" BOLT
SHELVES CAN FOLD BACK IF DESIRED BY REMOVING HAT DOWELS
WIRE FOR HANGING TIES
CROSS BAR
BRACE
BRACE
6'
SHOE RACK TILTS DOWNWARD
BRACE
2'3"

ABOUT a dollar's worth of lumber and a few hours in the workshop will produce a sure cure for the average crowded closet in the form of a handy tie, shoe, and hat-rack that is accessible, though suspended out of the way—on iron straps behind the closet door.

The average rack, 6 ft. long by 2¼ ft. wide, can be constructed of about 50 ft. of 2 in. by ¾ in. stock which can be bought cut to dimension or cut in the workshop as desired. Other necessary materials include twelve 2¼ in. by ¼ in. round-head bolts with nuts and washers, four lengths of perforated strap iron, ten cents worth of 1½ in. flat-head screws, and about six ft. of ¼ in. dowling.

The frame, a simple rectangle, is constructed of 2 in. lumber. It is kept from wobbling by the racks. The racks are built to the desired size and fastened inside the frame at regular intervals with the 2¼ in. by ¼ in. bolts. They are supported by braces fastened to the front of the frame.

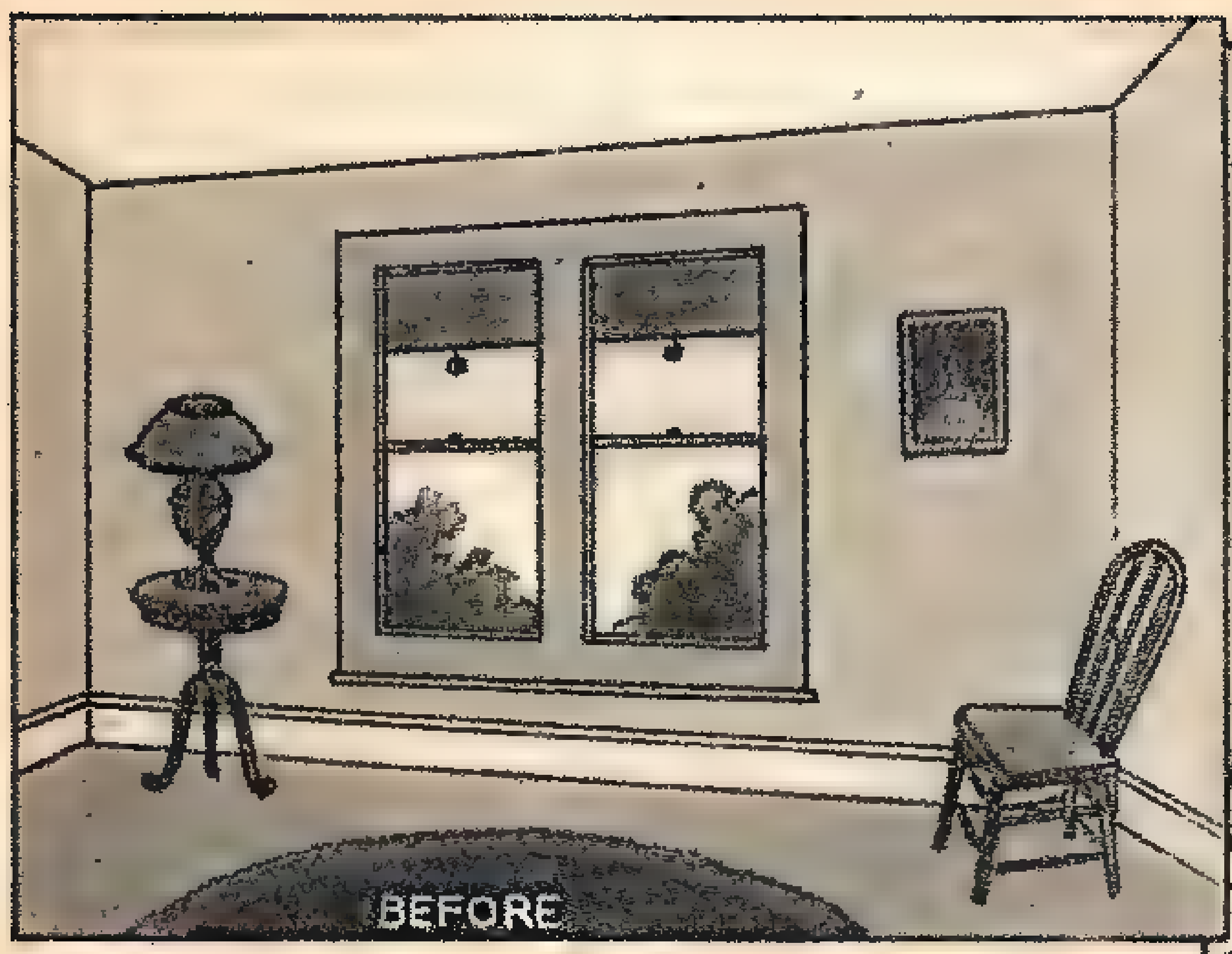
Sponge rubber balls are cut in two and placed on dowlings for hat holders, and a bar across the tilted shoe rack catches the heels to keep the shoes from falling.

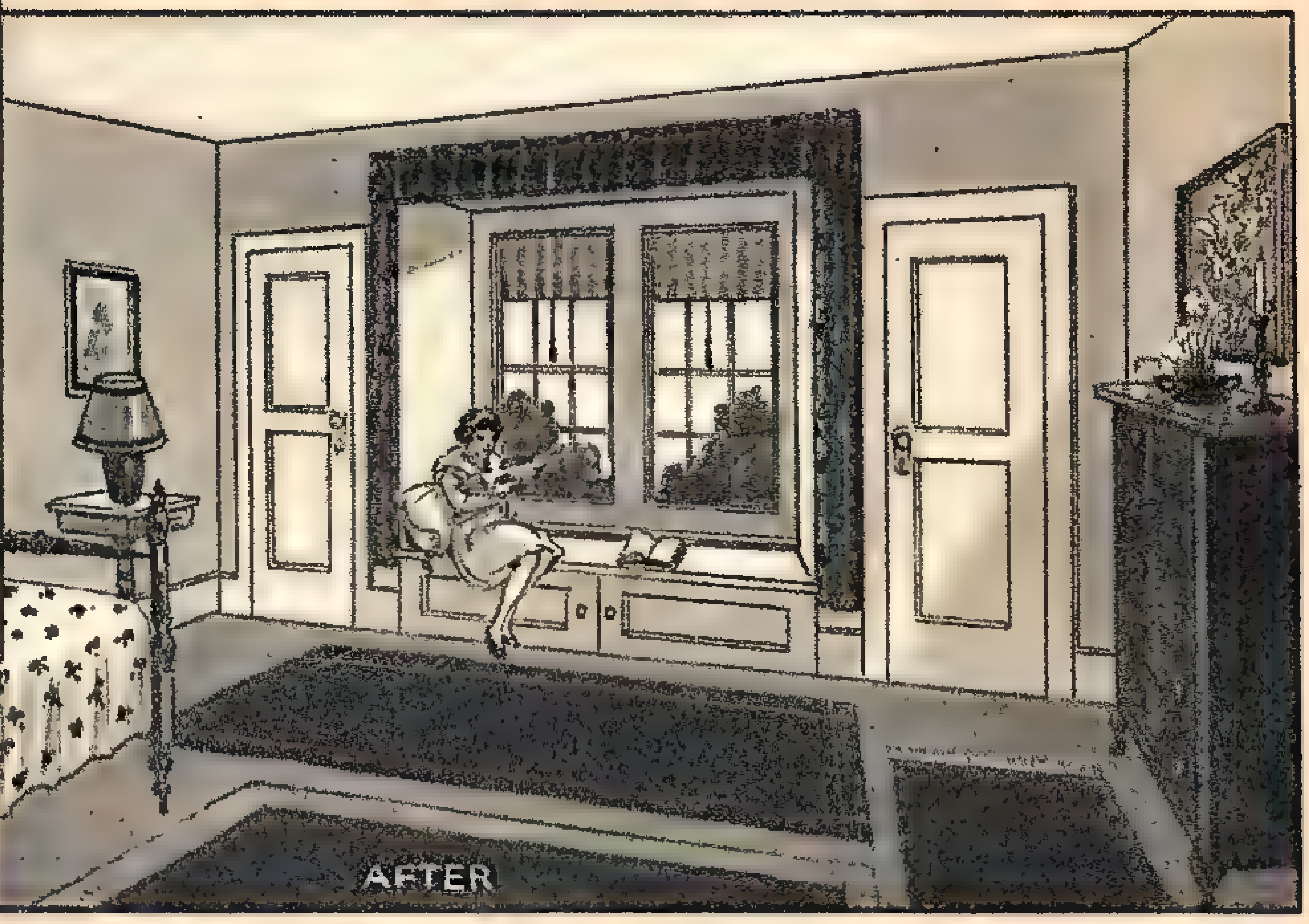
Fit Window Seat Between Closets

THE problem of inserting closet space into a rectangular room without producing an unbalanced bulk of blank wall in the corners is easily solved at small cost by partitioning off the window-end of the room to make two closets and a comfortable window-seat.

Using 2 by 3 inch studding covered with common plaster-board and buying the casings and doors to fit, this project can be completed in the average sized room for about $35.

If convenient, the window seat may be equipped with grills and used to cover an unsightly radiator, or doors may be hung in the wall underneath to afford the housewife extra storage room.—Mrs. W. J. Wade, December Home Improvement Contest Winner.

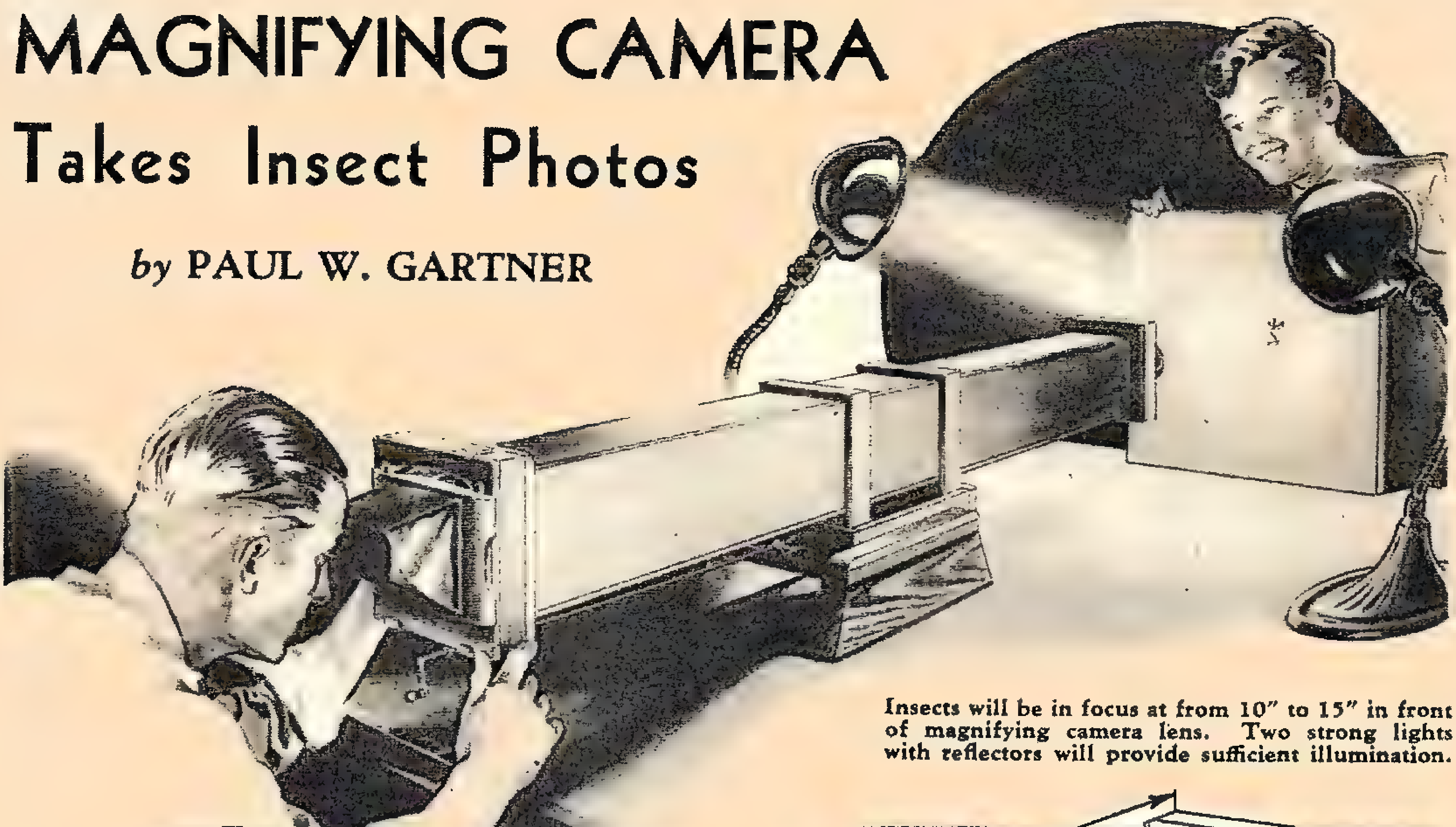




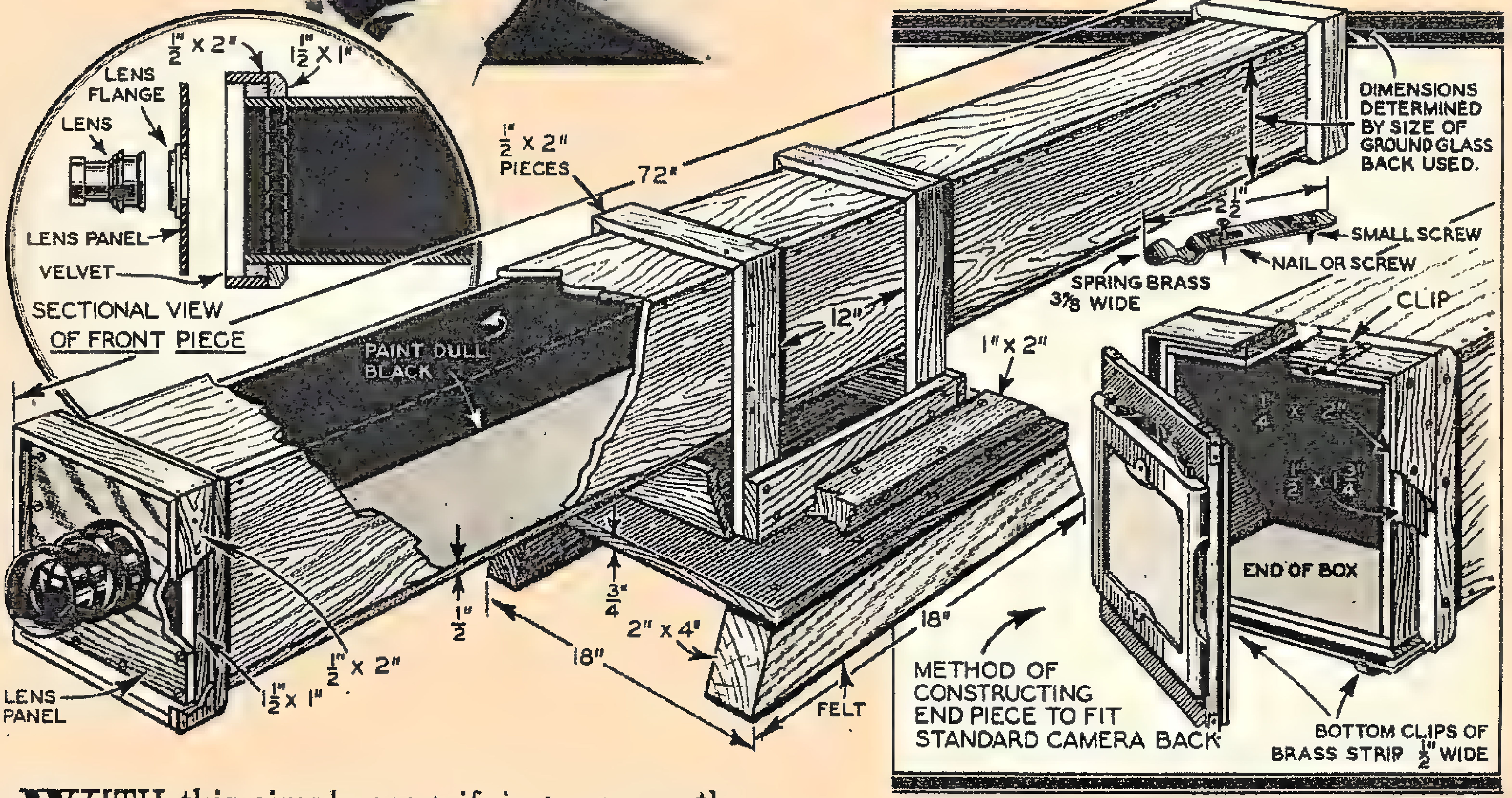
Above—A view showing the room before the installation of the new closets and window seats. Right—The same room after the closets were installed. The partition is made of plaster board fastened to two-by-three inch studding. This project in average sized room can be completed at an approximate cost of $35.

MAGNIFYING CAMERA
Takes Insect Photos

by PAUL W. GARTNER



Insects will be in focus at from 10" to 15" in front of magnifying camera lens. Two strong lights with reflectors will provide sufficient illumination.


½" x 2"
1½ X 1"
LENS FLANGE
LENS
LENS PANEL
VELVET
SECTIONAL VIEW OF FRONT PIECE
½" x 2" PIECES
72"
PAINT DULL BLACK
12"
1" x 2"
¾"
½"
2" x 4"
18"
LENS PANEL
½" x 2"
1½" x 1"
FELT
18"
DIMENSIONS DETERMINED BY SIZE OF GROUND GLASS BACK USED.
2½"
SMALL SCREW
NAIL OR SCREW
SPRING BRASS ⅜ WIDE
CLIP
¼" x 2"
½" x 1¾"
END OF BOX
METHOD OF CONSTRUCTING END PIECE TO FIT STANDARD CAMERA BACK
BOTTOM CLIPS OF BRASS STRIP ½" WIDE

Barrel 6" square will take 4"x5" ground glass screen. Glass is easily replaced with film if back of old plate camera is mounted at end of barrel. Glue strips of velvet to contact edges to maintain light-tight joint between camera and box.

WITH this simple magnifying camera the actions of tiny insects, enlarged many times on the ground glass screen, offer a fascinating field of study. By replacing the glass with a film, pictures of these insects, or of any other small objects such as pins, printing, or stamps can be made.

The barrel of the camera is built up of light boards assembled with light-tight joints. Paint the inside a dull black before assembling.

The camera described here has an 8-inch focal length lens, but almost any good lens will serve the purpose. Here again the lens setting must be light-tight. The lens may be fixed solidly, since focusing is done by moving the subject.

The 6"x6" dimensions are suitable for a 4"x5" ground glass screen, which should be removable so that plates or film may be inserted in the same plane of focus.

The magnifying camera requires two persons for its operation—one to move the subject, the other to watch the screen to check focus and centering.

The depth of focus on a camera such as this is very slight—only a fraction of an inch—so it is not likely all parts of an insect will be in focus at the same time. The lens may of course be stopped down and a time exposure made, to increase the depth of focus.

Unfolding the *Mysteries*

by **SAM S. RABL**
Naval Architect

TO THE seasoned boatbuilder the terms used by a naval architect in describing the design and building of a new boat have a world of meaning; to the beginner they can be as puzzling and incoherent as a foreign language.

Laying down is the term applied to the process of enlarging the small scale drawings of the architect to full size; this must be done before a single timber can be cut for the boat. *Taking off* is the term applied to the transferring the curves and dimensions on this full size plan to the frame timbers of the boat.

Before we go into the mechanics of the

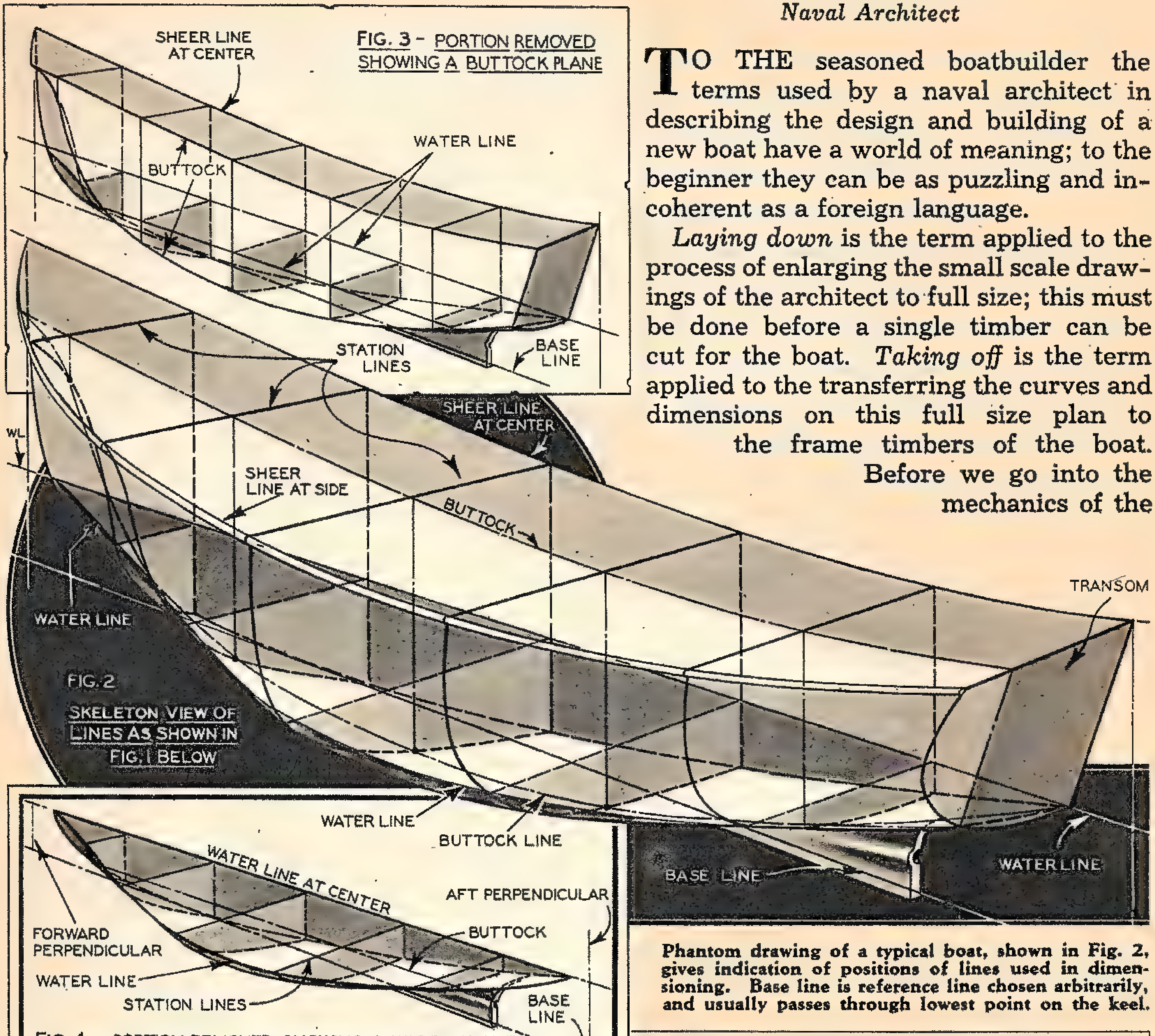

SHEER LINE AT CENTER
BUTTOCK
WATER LINE
STATION LINES
BASE LINE
SHEER LINE AT CENTER
WL
SHEER LINE AT SIDE
BUTTOCK
WATER LINE
TRANSOM
WATER LINE
BUTTOCK LINE
BASE LINE
WATER LINE
WATER LINE AT CENTER
AFT PERPENDICULAR
FORWARD PERPENDICULAR
BUTTOCK
WATER LINE
STATION LINES
BASE LINE

FIG. 3 - PORTION REMOVED SHOWING A BUTTOCK PLANE

FIG. 2 SKELETON VIEW OF LINES AS SHOWN IN FIG. 1 BELOW

FIG. 4 - PORTION REMOVED SHOWING A WATER PLANE

Phantom drawing of a typical boat, shown in Fig. 2, gives indication of positions of lines used in dimensioning. Base line is reference line chosen arbitrarily, and usually passes through lowest point on the keel.

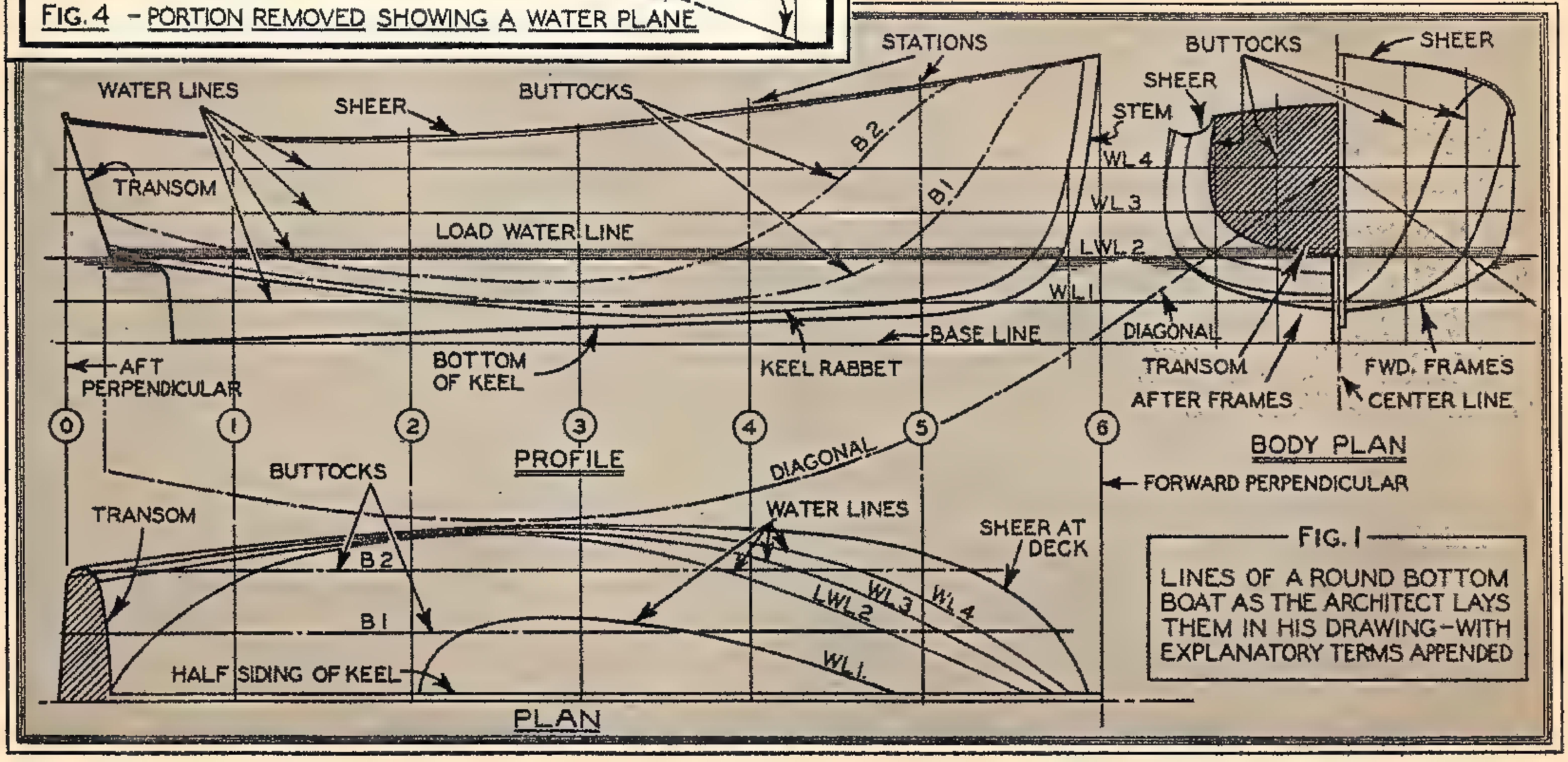

STATIONS
BUTTOCKS
SHEER
WATER LINES
SHEER
BUTTOCKS
SHEER
STEM
B2
WL 4
TRANSOM
B1
WL 3
LOAD WATER LINE
LWL 2
WL 1
BASE LINE
DIAGONAL
AFT PERPENDICULAR
BOTTOM OF KEEL
KEEL RABBET
TRANSOM
AFTER FRAMES
FWD. FRAMES
CENTER LINE
0
1
2
3
4
5
6
PROFILE
BODY PLAN
BUTTOCKS
DIAGONAL
FORWARD PERPENDICULAR
TRANSOM
WATER LINES
SHEER AT DECK
B2
WL 3
WL 4
LWL 2
B1
WL 1
HALF SIDING OF KEEL
PLAN

FIG. 1 LINES OF A ROUND BOTTOM BOAT AS THE ARCHITECT LAYS THEM IN HIS DRAWING—WITH EXPLANATORY TERMS APPENDED

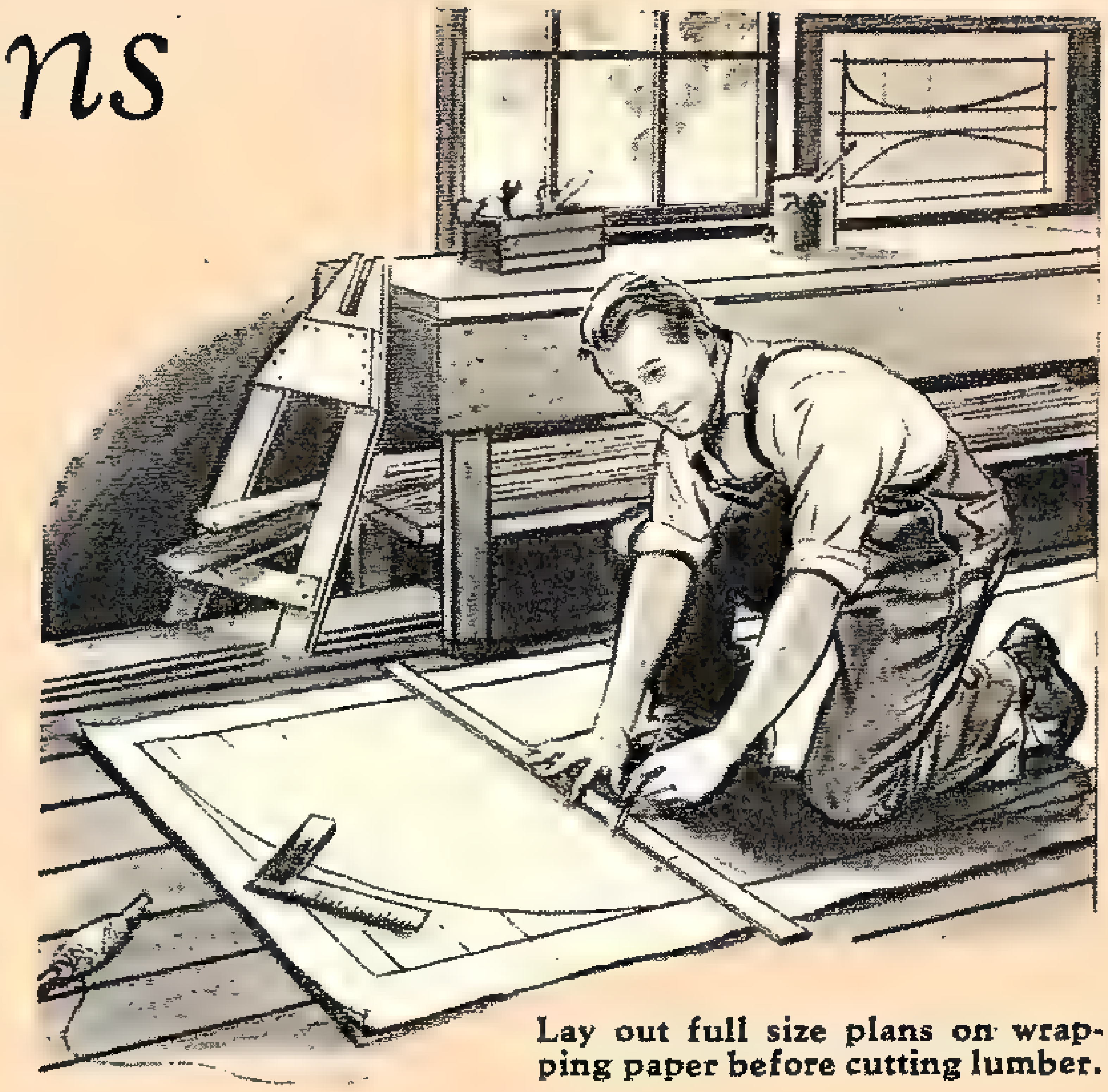
These three views—profile, body, and plan, are sufficient when accompanied by table of offsets, to give all information needed by experienced boat builder. In process of "laying down" these views are enlarged to full size on shop floor.

# of BOAT Plans

To one planning to build his first boat, the plans and specifications of the naval architect are a maze of hieroglyphics—a discouraging stumbling block. This experienced designer here explains how to follow boat-building plans properly.

actual laying down, an explanation of the terms used in this process will be a great help. The complete set of curves that depict a boat shape is called the *lines*. The lines plan is usually divided into three views. The *profile* depicts the shape of the boat as we see her from the side in normal position.

The *plan* is really a "fish-eye view," showing how the boat appears when looking at her from a point directly beneath her keel.



Lay out full size plans on wrapping paper before cutting lumber.

The *body plan* shows the boat as she would appear if we were to look directly at the ends. This plan is usually drawn with the forward frames on one side of the center and the after frames on the other. The two sides of the hull are seldom drawn, as the shape is supposed to be symmetrical. The lines which represent the frame or mould positions are known as the *frame lines* or *station lines*. Examples of each view are shown in the sketches accompanying this article.

All vertical dimensions on a boat are usually

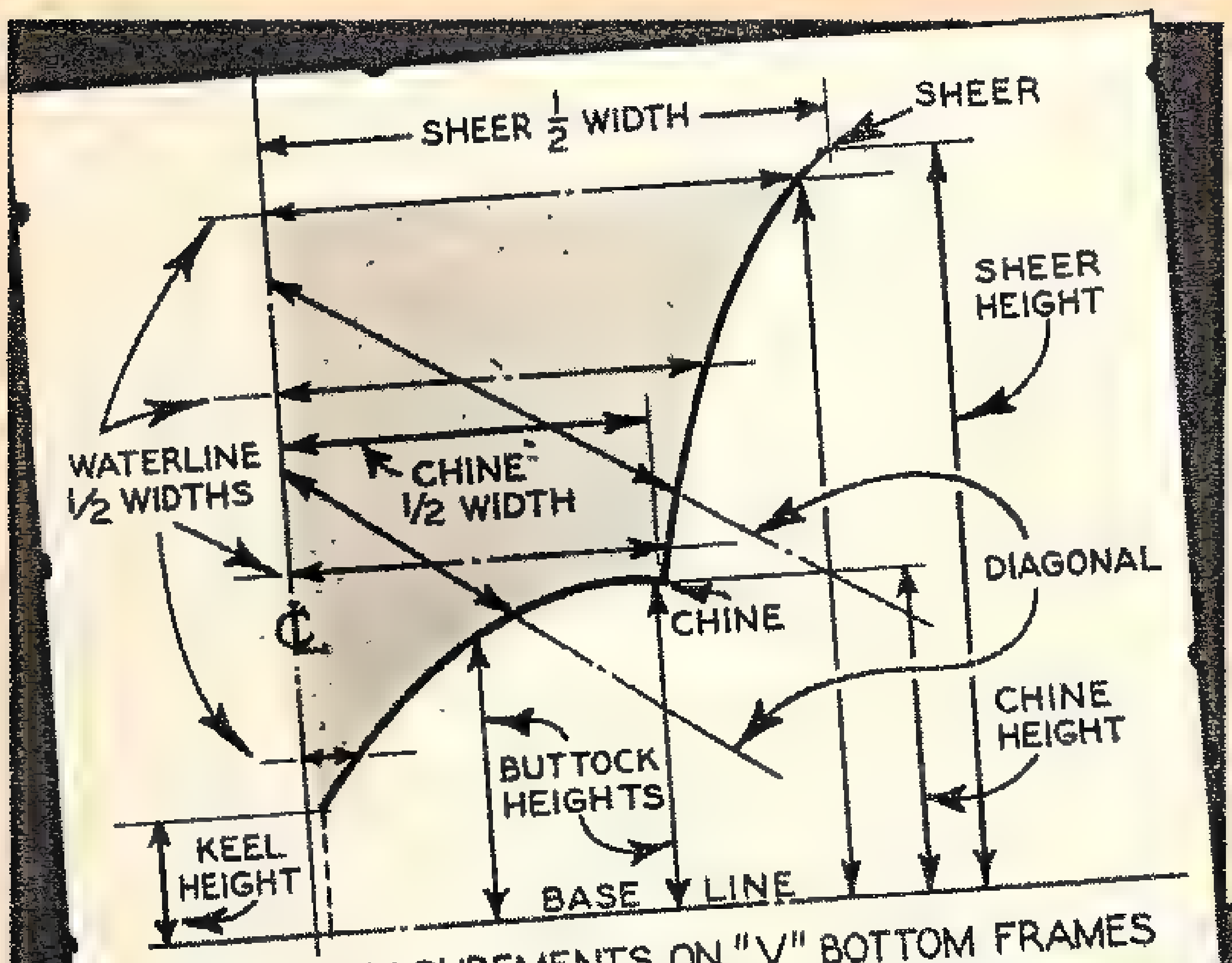
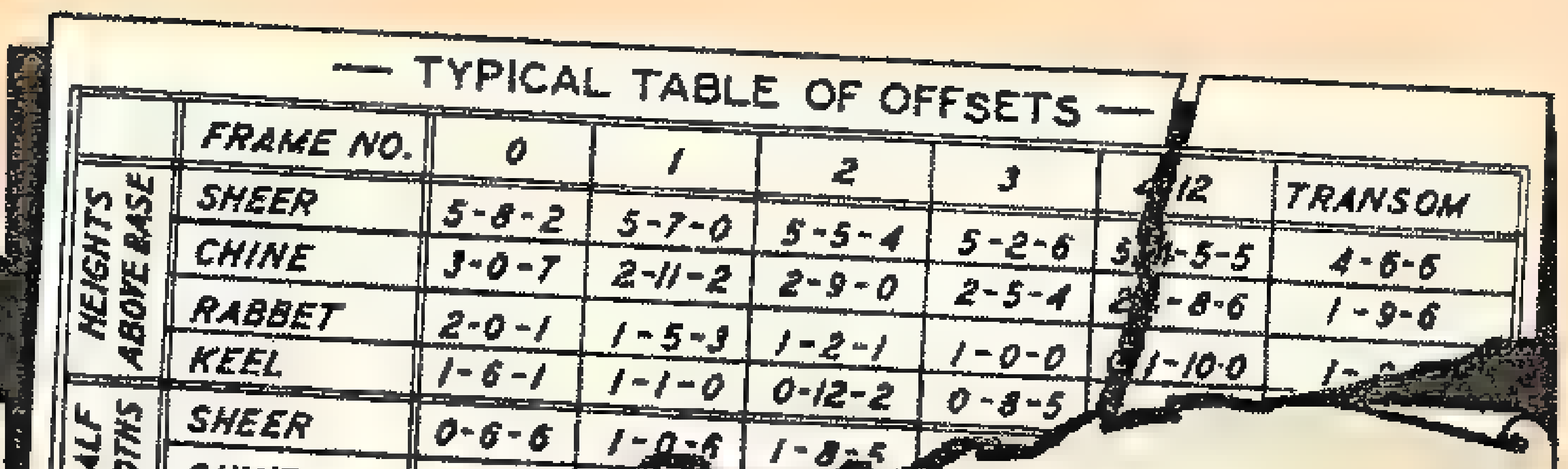

SHEER ½ WIDTH
SHEER
SHEER HEIGHT
WATERLINE ½ WIDTHS
CHINE ½ WIDTH
DIAGONAL
℄
CHINE
CHINE HEIGHT
BUTTOCK HEIGHTS
KEEL HEIGHT
BASE LINE

FIG. 6 — MEASUREMENTS ON "V" BOTTOM FRAMES



— TYPICAL TABLE OF OFFSETS —

	FRAME NO.	0	1	2	3	4	12	TRANSOM
HEIGHTS ABOVE BASE	SHEER	5-8-2	5-7-0	5-5-4	5-2-6	5	-5-5	4-6-6
	CHINE	3-0-7	2-11-2	2-9-0	2-5-4	2	-8-6	1-9-6
	RABBET	2-0-1	1-5-3	1-2-1	1-0-0		1-10-0	1-
	KEEL	1-6-1	1-1-0	0-12-2	0-8-5			
HALF WIDTHS	SHEER	0-6-6	1-0-6	1-8-5				
	CHINE	0-3-						

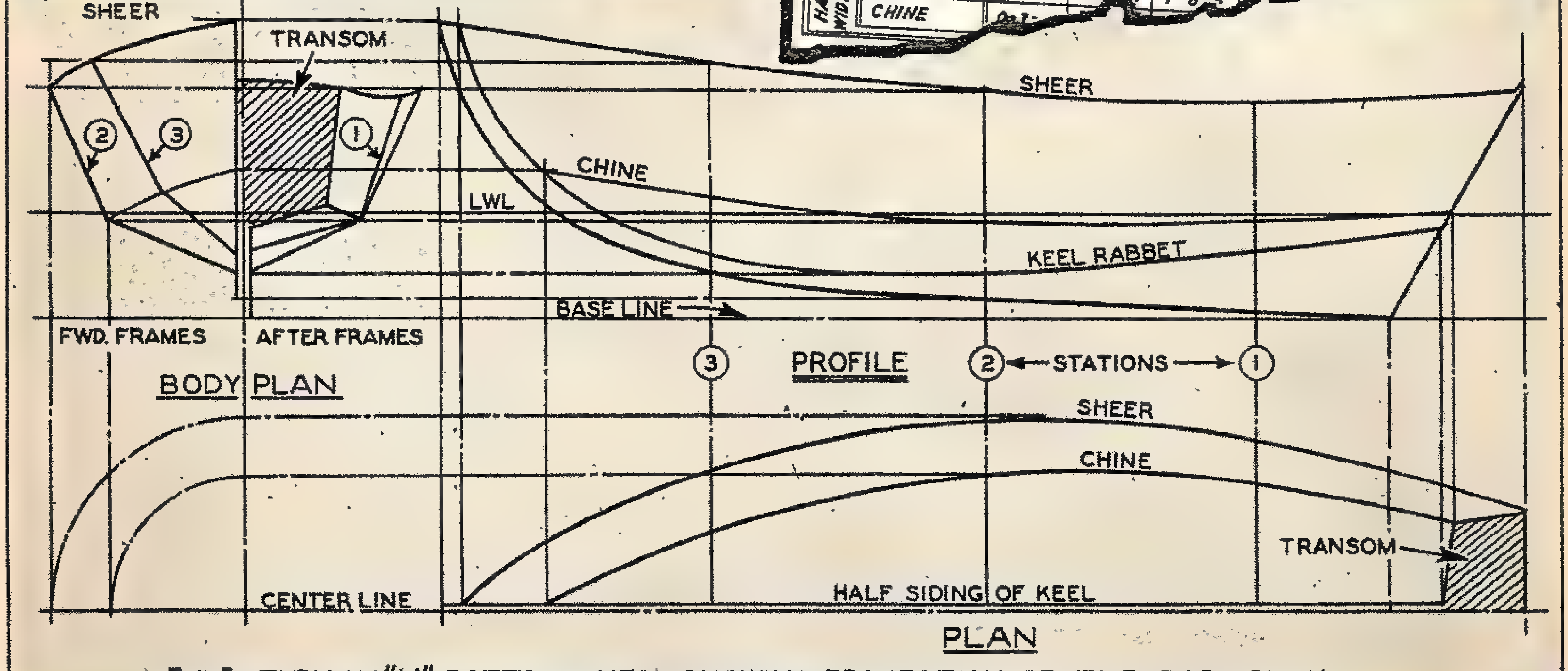

SHEER
TRANSOM
2
3
1
LWL
CHINE
KEEL RABBET
BASE LINE
FWD. FRAMES
AFTER FRAMES
BODY PLAN
3
PROFILE
2
STATIONS
1
SHEER
CHINE
TRANSOM
CENTER LINE
HALF SIDING OF KEEL
PLAN

FIG. 5 TYPICAL "V" BOTTOM LINES SHOWING PROJECTION OF THE BODY PLAN

V-bottom boats offer slightly different building problems from round-bottom craft, but three views are still sufficient to represent the boat. Typical table of offsets, giving dimensions with reference to the base line and center line at different stations, is shown above. Dimensions are given in feet, inches, and eighths. 5-8-2 is then 5′, 8¼″. Meanings of sheer and chine are shown in Fig. 6, above. LWL is low waterline, where the boat should float when empty. Base line is reference line.

Make Projections from Full-Size Plans to Check Fairness of Lines

given with reference to the *base line,* an arbitrarily chosen line passing the length of the boat just under the keel or lowest point. On plan views the projection of the *base line* is always known as the *center line.*

Any horizontal cut through the hull parallel to the base line forms a plane which would be called a *waterline* if we were referring to its boundary or a *waterplane* if we refer to the entire plane. If on the other hand we were to make a cut through the hull in a vertical plane parallel to its centerline we would form a *buttock* and buttockplane or *vertical plane.* In some old books we may find what we term the buttocks today divided into two classes of lines. The forward portions were termed the bow lines, and those at the stern end buttocks.

A diagonal cut through the hull lengthwise with one edge parallel to the centerline is termed a *diagonal;* this type of line is often used to give measurements which, because of curves in the hull, would be inconvenient to give on either waterlines or buttocks.

In the preliminary examination of a set of lines a good rule to remember is "Waterlines always appear as *straight* lines in the profile and as *curved* lines in the plan. Buttocks always appear as *curved* lines in the profile and as *straight* lines in the plan. Station lines appear as *straight* lines in both profile and plan. Waterlines and buttocks as well as diagonals appear as *straight* lines in the

These "laying down" methods are used for round bottom hulls.

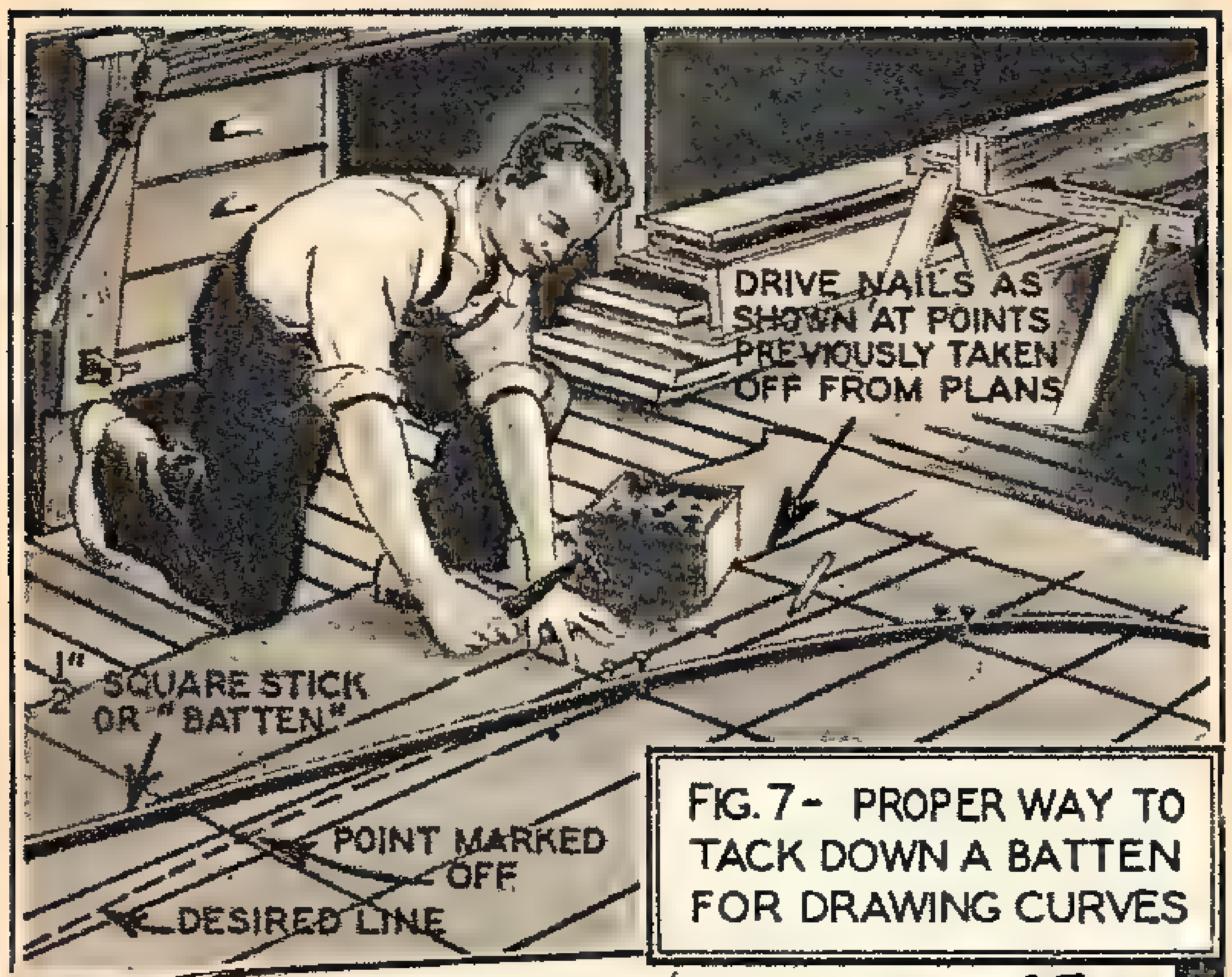

DRIVE NAILS AS SHOWN AT POINTS PREVIOUSLY TAKEN OFF FROM PLANS
½" SQUARE STICK OR "BATTEN."
POINT MARKED OFF
DESIRED LINE

FIG. 7- PROPER WAY TO TACK DOWN A BATTEN FOR DRAWING CURVES

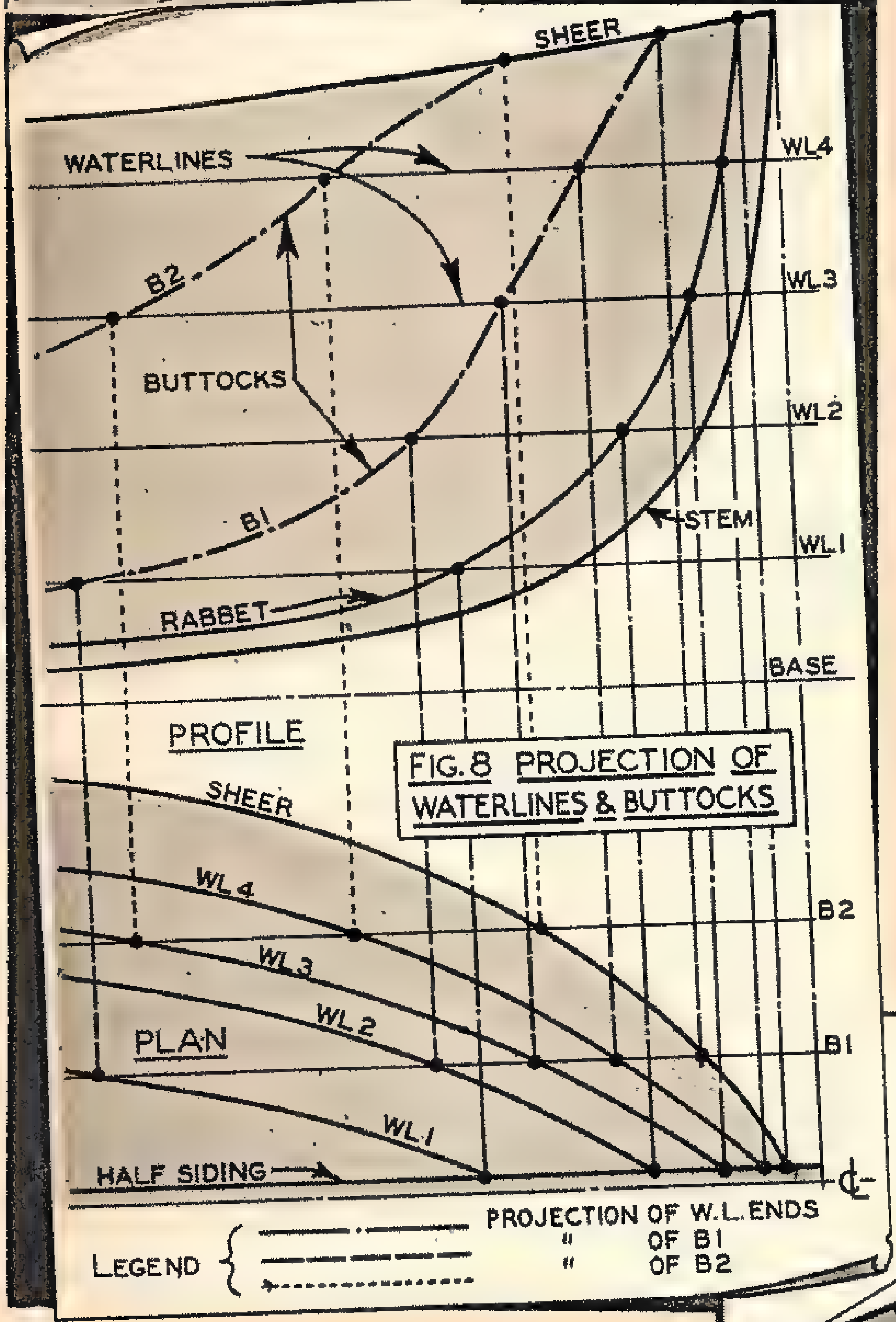

SHEER
WATERLINES
WL4
B2
WL3
BUTTOCKS
WL2
B1
STEM
WL1
RABBET
BASE
PROFILE
SHEER
WL 4
B2
WL 3
WL 2
PLAN
B1
WL 1
HALF SIDING
℄
LEGEND
PROJECTION OF W.L. ENDS
" OF B1
" OF B2

FIG. 8 PROJECTION OF WATERLINES & BUTTOCKS

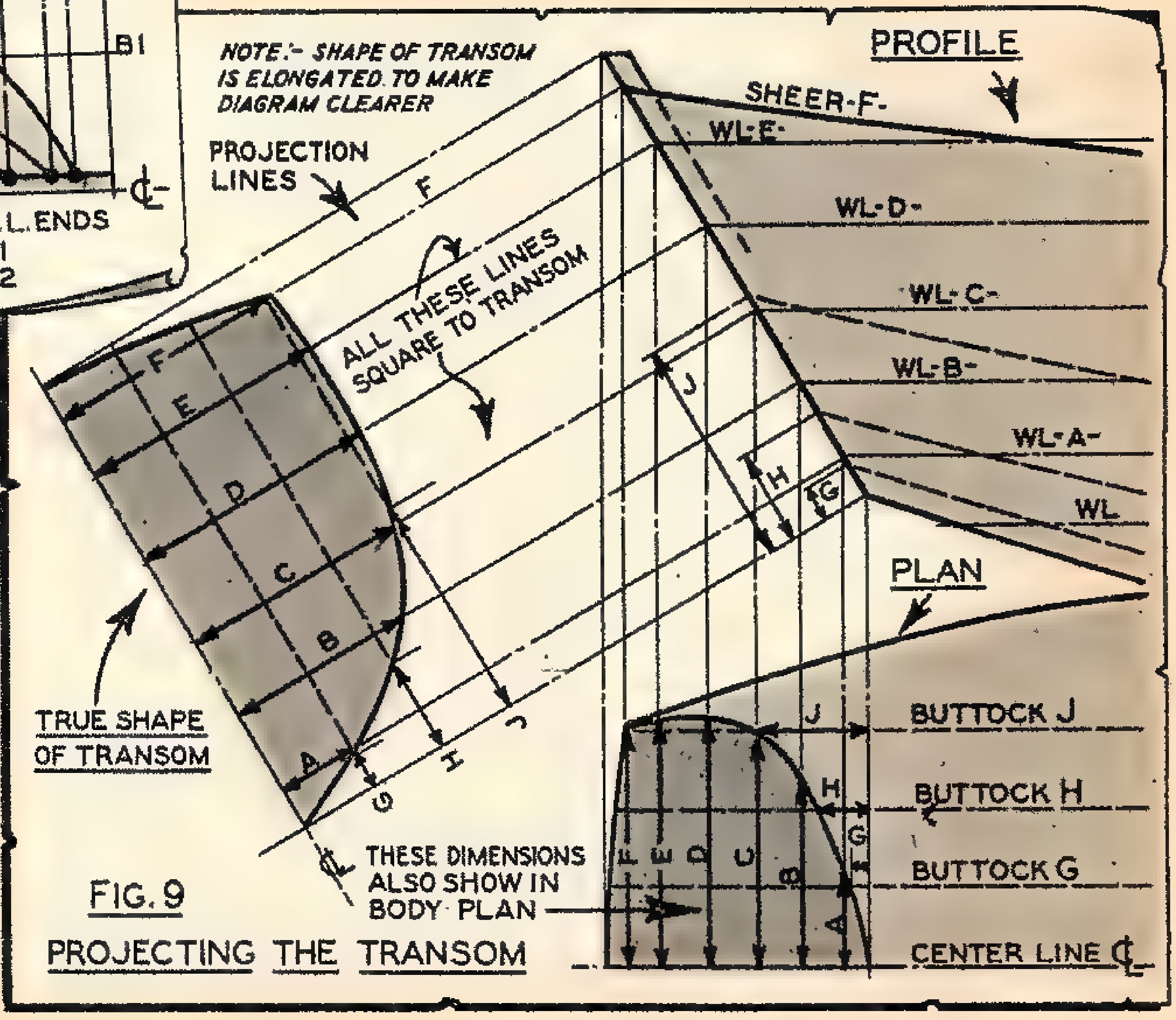

NOTE:- SHAPE OF TRANSOM IS ELONGATED TO MAKE DIAGRAM CLEARER
PROFILE
SHEER-F-
WL-E-
PROJECTION LINES
F
WL-D-
ALL THESE LINES SQUARE TO TRANSOM
WL-C-
WL-B-
F
E
J
WL-A-
D
H
G
WL
C
PLAN
B
TRUE SHAPE OF TRANSOM
A
G
H
J
J
BUTTOCK J
H
BUTTOCK H
G
BUTTOCK G
F E D C B A
THESE DIMENSIONS ALSO SHOW IN BODY PLAN
CENTER LINE ℄
℄

FIG. 9 PROJECTING THE TRANSOM

BOAT-BUILDER'S DICTIONARY

LINES—set of curves giving shape of boat.
PROFILE—view looking at side of boat.
PLAN—view looking at bottom of boat.
BODY PLAN—view looking at end of boat.
BASE LINE—arbitrary height reference line.
CENTER LINE—reference line for widths.
BUTTOCK—line through hull formed by vertical slice parallel to center-line.
WATERLINE—line through hull formed by horizontal slice parallel to reference line.
OFFSET—distance from either reference line.
BATTEN—wood stick used to draw curves.
TRANSOM—stern end of boat (usually flat).
SPILING—transferring planking curves.
STEM—curved frame piece at bow of boat.
SHEER—highest line on profile.
CHINE—intersection of sides with bottom.

Keel and Stem of Boat May Be Accurately Laid Out from Large Plans

body plan while station lines will appear *curved*."

The foregoing rule applies to boats with full curved sections, shown in Figures 1 to 4. The "V" bottom boat presents a slightly different problem but the lines are much more simple. An examination of Fig. 5 will serve to explain them. Fig. 6 shows how measurements are taken on the curved frame "V" bottom craft.

The architect in making the lines plan of a wooden boat always works to the outside of the planking. This should be the rule unless it is positively stated on the plan that the lines are to the inside of the planking. In drawing the plan the architect uses a predetermined scale; usually ¾″ or 1″ represents 1 ft. on the actual job.

To give measurements on the lines the architect either furnishes a table of offsets or gives the measurements directly on the plan. An *offset* is either the distance a certain point is from the centerline in case of widths, or above the base line in case of heights. Vertical offsets are sometimes taken above and below the load waterline. Offsets are also given along diagonals.

Almost invariably offsets are given in feet, inches, and eighths. Thus 3-7-5 when translated will mean three feet, seven inches and five eights, or 3′-7⅝″. A rule to remember in reading offsets is that half widths are given out from the centerline, and heights are given with reference to the base line or load water line.

[*Continued on page* 118]

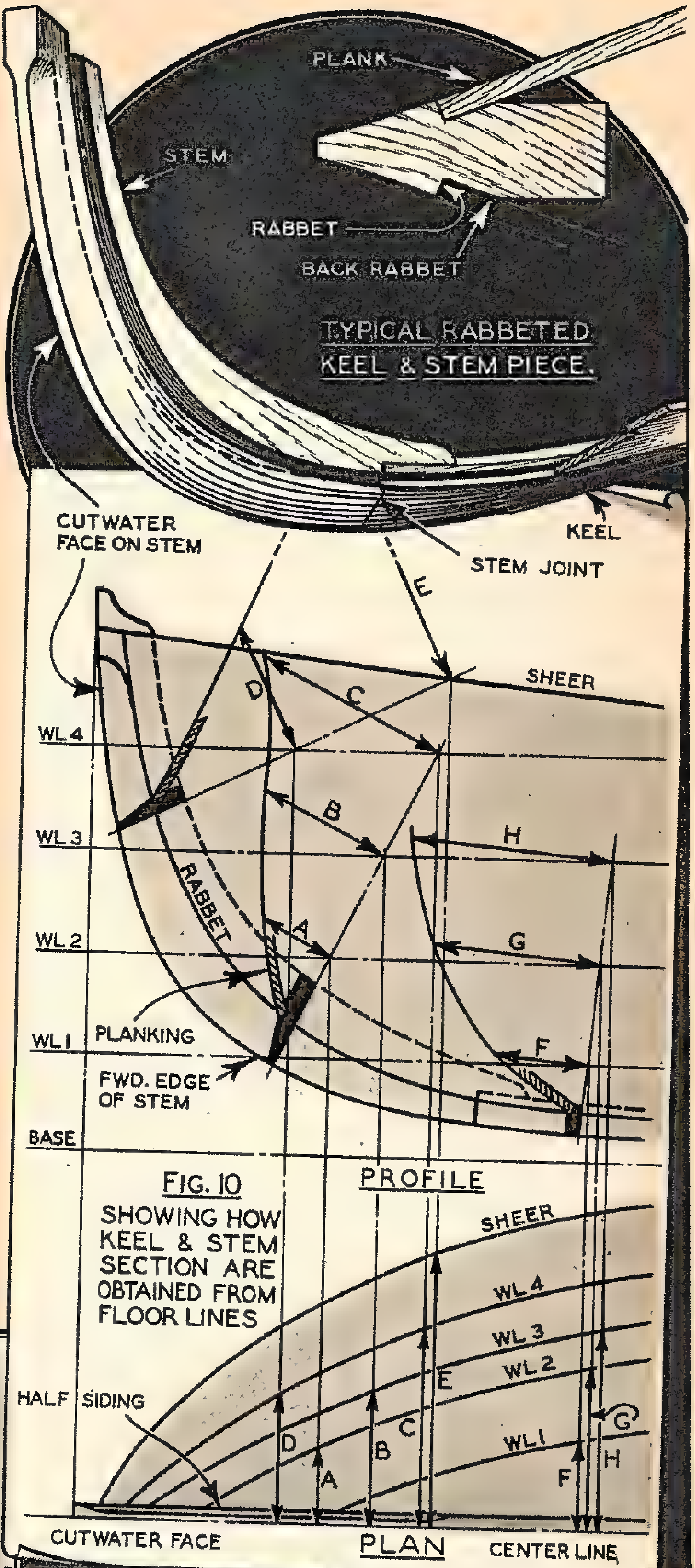
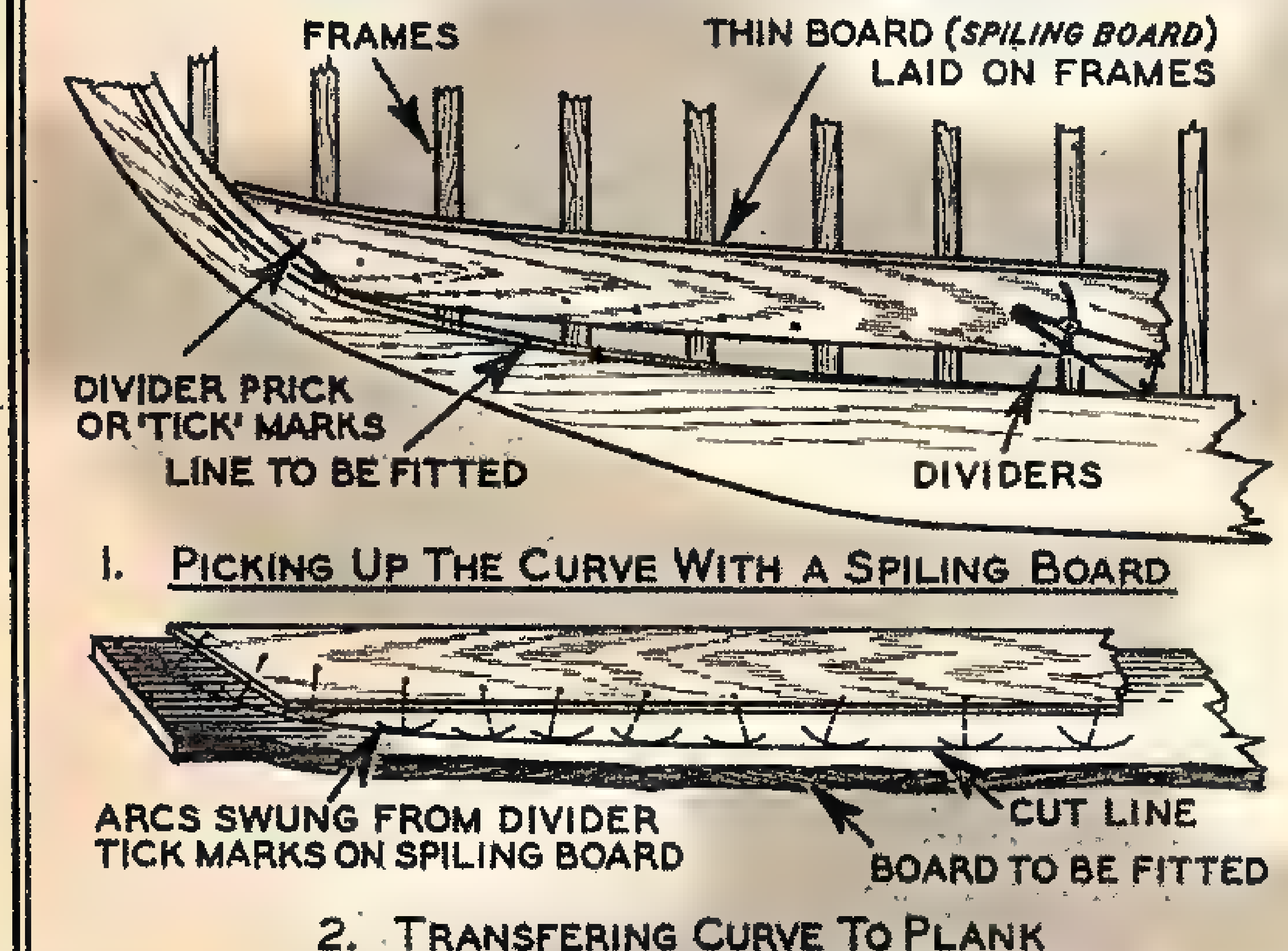

PLANK
STEM
RABBET
BACK RABBET
TYPICAL RABBETED KEEL & STEM PIECE.
CUTWATER FACE ON STEM
KEEL
STEM JOINT
E
SHEER
D
C
WL 4
B
WL 3
H
RABBET
WL 2
A
G
WL 1
PLANKING
F
FWD. EDGE OF STEM
BASE
PROFILE
SHEER
WL 4
WL 3
WL 2
E
HALF SIDING
C
D
B
WL 1
G
A
F
H
CUTWATER FACE
PLAN
CENTER LINE

FIG. 10 SHOWING HOW KEEL & STEM SECTION ARE OBTAINED FROM FLOOR LINES

FIG. 11 - COMMONEST METHOD OF SPILING PLANKS

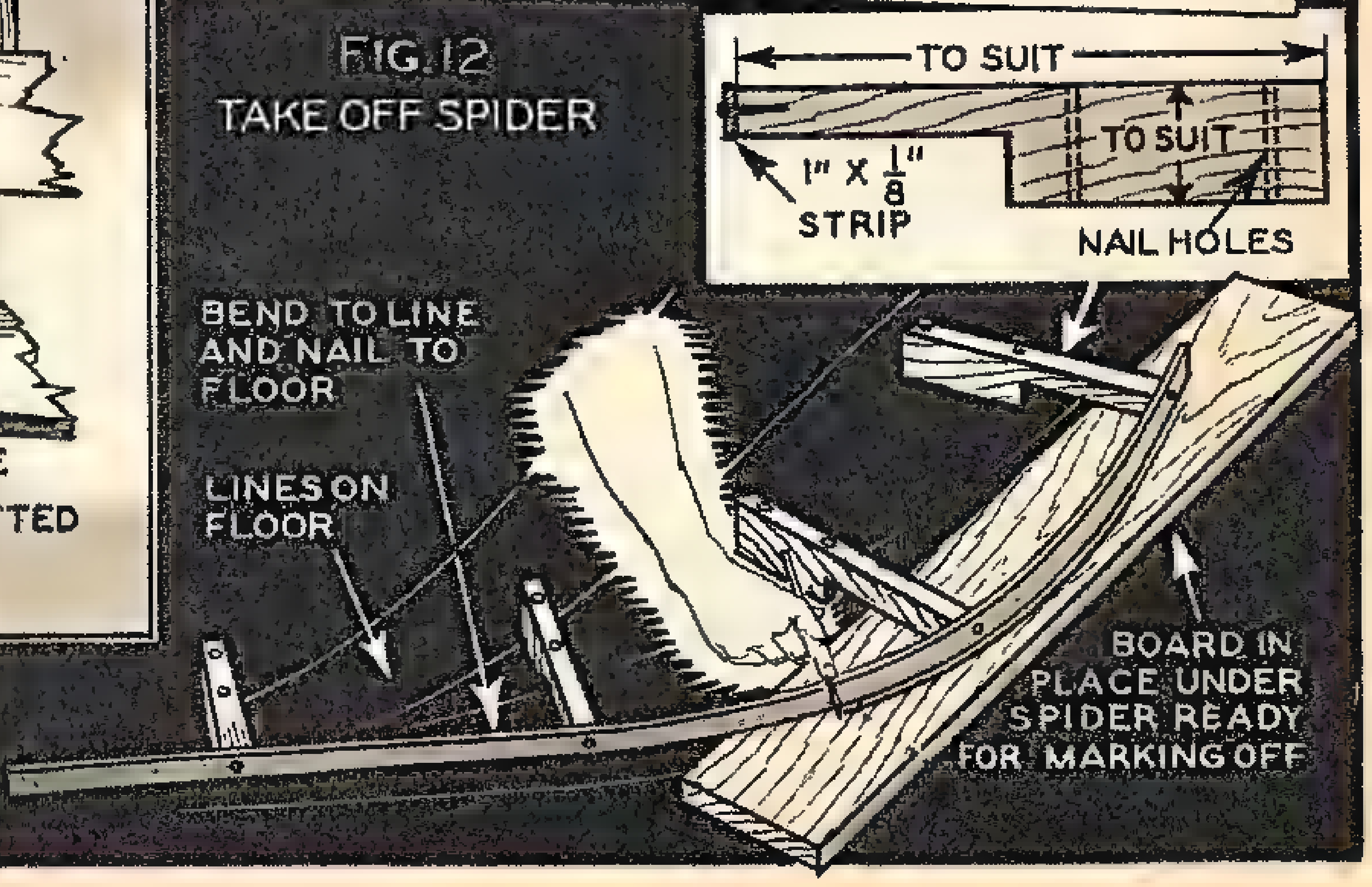

FRAMES
THIN BOARD (SPILING BOARD) LAID ON FRAMES
DIVIDER PRICK OR 'TICK' MARKS
LINE TO BE FITTED
DIVIDERS
ARCS SWUNG FROM DIVIDER TICK MARKS ON SPILING BOARD
CUT LINE
BOARD TO BE FITTED

1. Picking Up The Curve With A Spiling Board

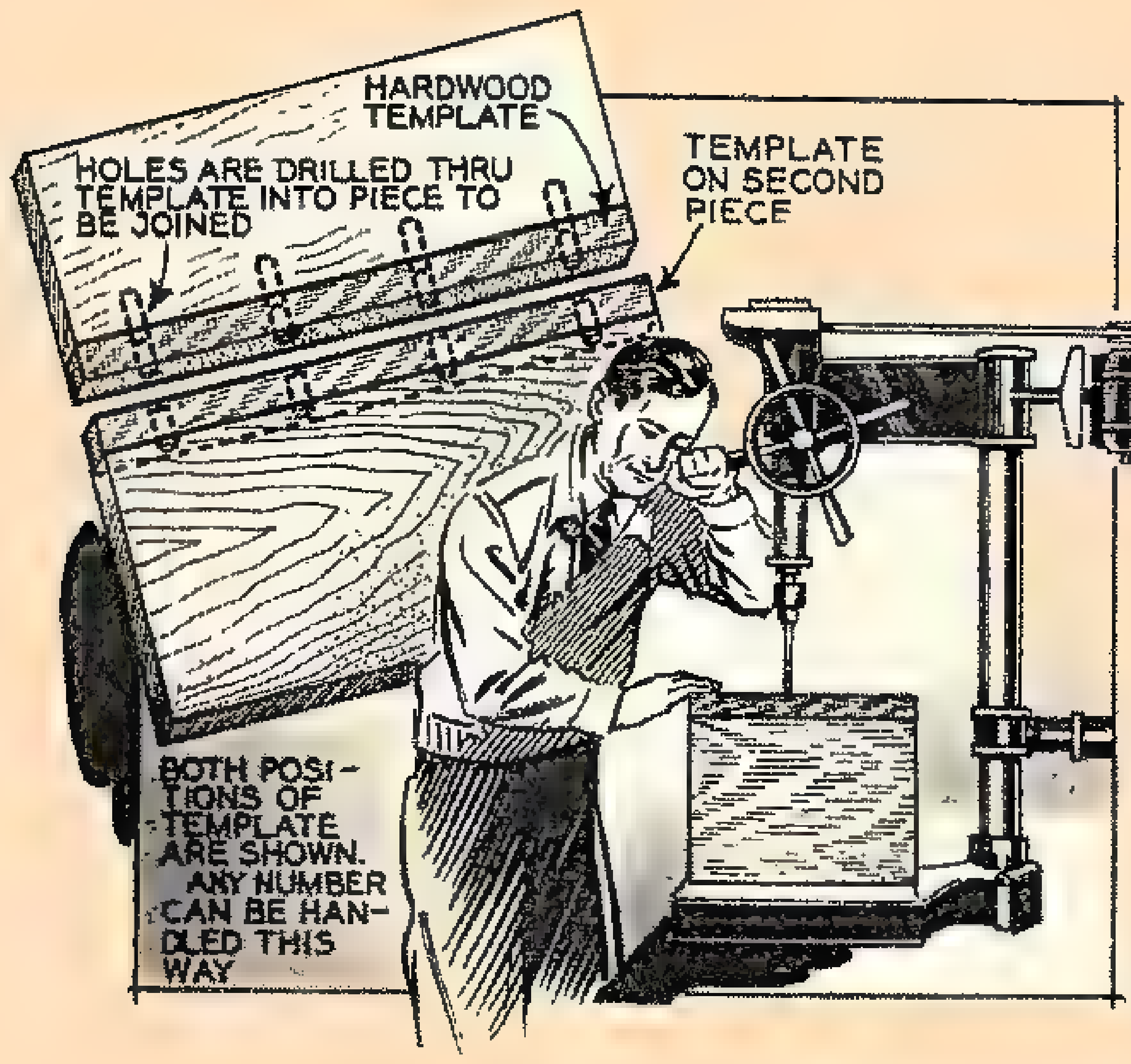
2. Transfering Curve To Plank

Method of transferring curves from partly finished boat to next piece of planking is indicated above. Planks should fit perfectly without need for excessive forcing into position. Keep dividers at right angles to plank already on boat to get the correct distance.

FIG. 12 TAKE OFF SPIDER


TO SUIT
TO SUIT
1″ x ⅛″ STRIP
NAIL HOLES
BEND TO LINE AND NAIL TO FLOOR
LINES ON FLOOR
BOARD IN PLACE UNDER SPIDER READY FOR MARKING OFF

HANDY USES FOR SHOP TOOLS

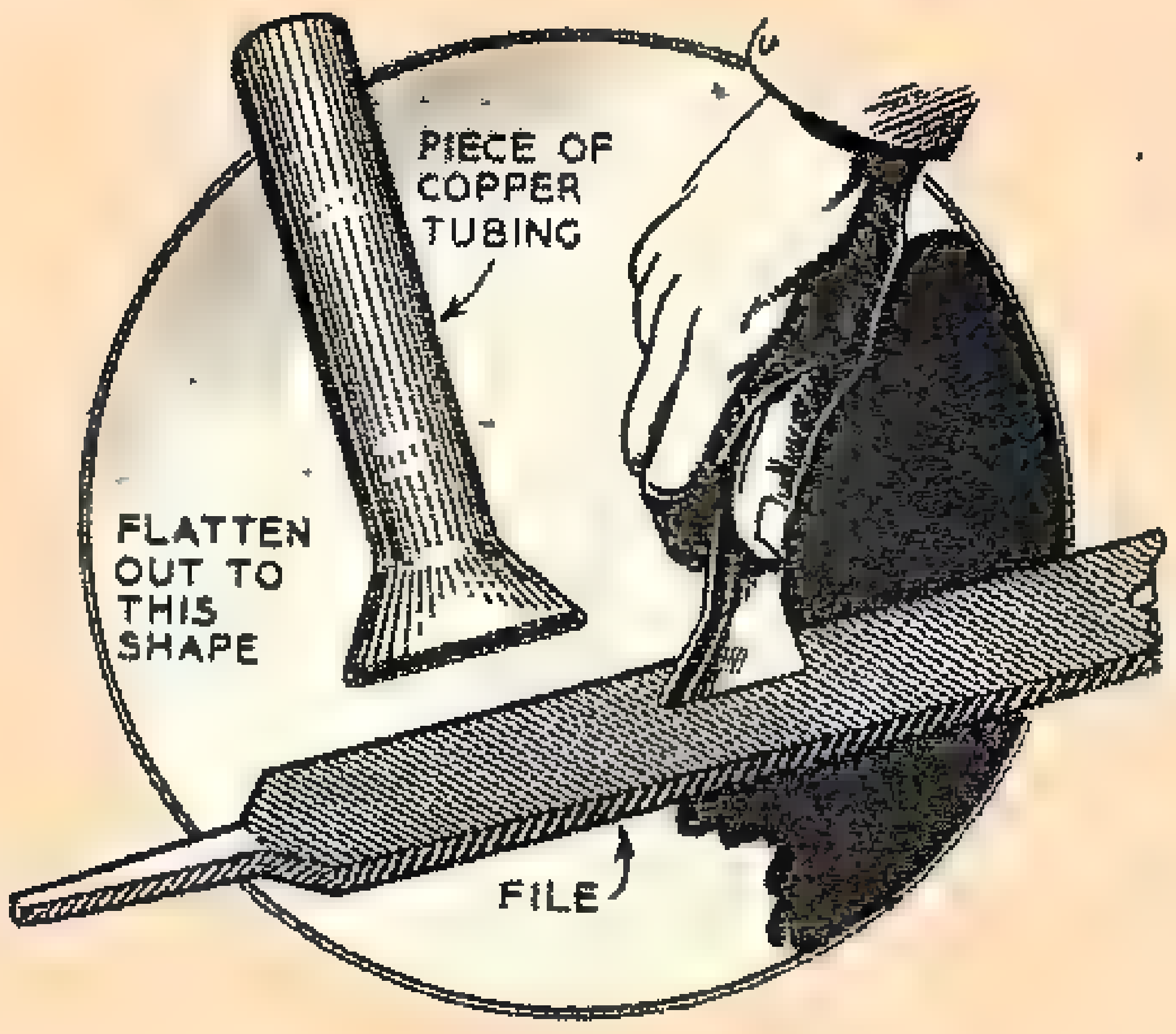

HARDWOOD TEMPLATE
HOLES ARE DRILLED THRU TEMPLATE INTO PIECE TO BE JOINED
TEMPLATE ON SECOND PIECE
BOTH POSITIONS OF TEMPLATE ARE SHOWN. ANY NUMBER CAN BE HANDLED THIS WAY

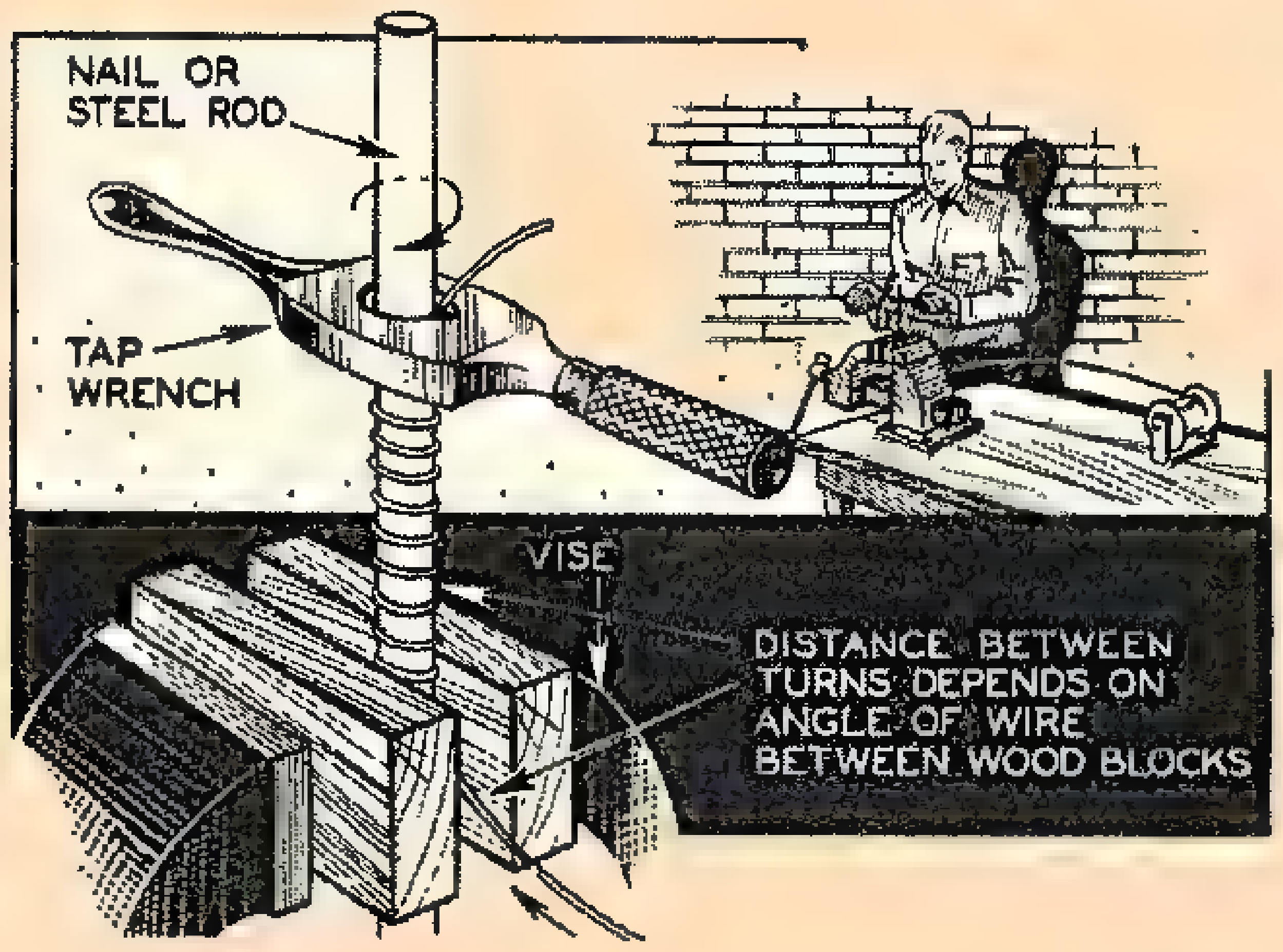
Align Dowels Accurately With Wood Jig

PERFECT joints can be made with wood even though no standard dowel hole boring jig is available. Make a wood template containing the dowel holes in their proper locations, as pictured in the sketch, using either a steel square or a drill press to insure that the holes are perpendicular. To use, lightly nail the template to one side of the joint, bore the dowel holes, then nail the opposite side of the template to the other joint and repeat. Dowels will now fit perfectly.—K. E. Frick.

File Cleaners Made of Copper Tubing

FILES often become gummed up with lead or other soft metals. Short lengths of copper tubing which are flattened at one end make very serviceable cleaners, the flat end being rubbed over the file in the direction of the ridges. The rounded tubing makes a comfortable handle to work with, and the tool is easily carried in the shop kit.—G. E. Hendrickson.


PIECE OF COPPER TUBING
FLATTEN OUT TO THIS SHAPE
FILE

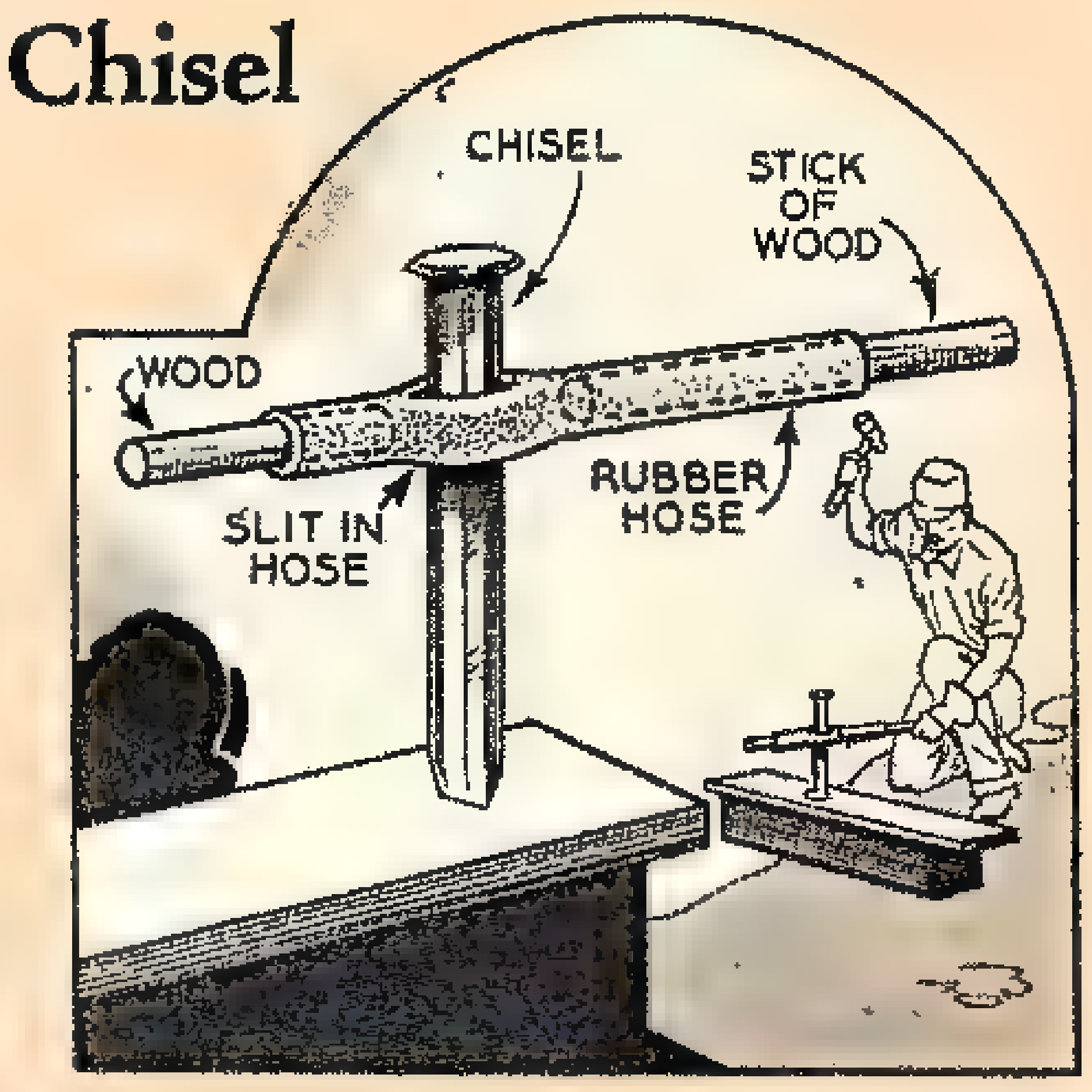

NAIL OR STEEL ROD
TAP WRENCH
VISE
DISTANCE BETWEEN TURNS DEPENDS ON ANGLE OF WIRE BETWEEN WOOD BLOCKS

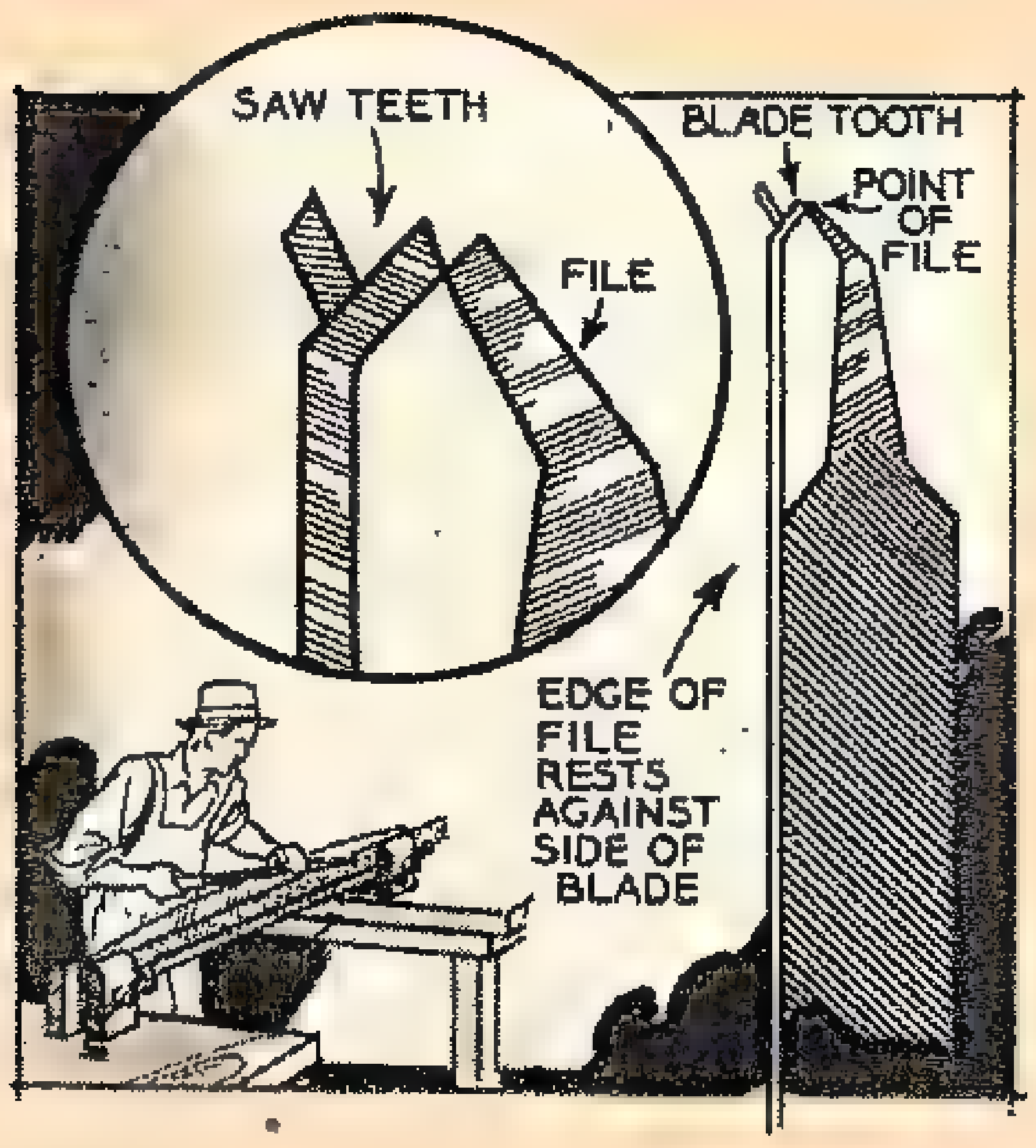
Rewind Stretched Springs Without Lathe

COIL springs of any desired diameter and spacing are easily wound either from old springs or from wire in the manner shown in the sketch. The angle of the wire before it is squeezed between the wood blocks determines the distance between turns. C clamps may replace the vise. A pipe wrench may also be used on the rod.—Robert Macgregor.

Holder for Cold Chisel

WHEN using a chisel or punch, there is always risk of injury to the hands from a glancing blow of the hammer. A 16-inch length of garden or air hose, in which a slot has been cut 2 inches from one end, makes a convenient holder. Wood plugs fitted into the ends of the hose serve as handles and make the holder more rigid. Rock drills are used same way.—R. A. Meeks.


CHISEL
STICK OF WOOD
WOOD
SLIT IN HOSE
RUBBER HOSE


SAW TEETH
FILE
BLADE TOOTH
POINT OF FILE
EDGE OF FILE RESTS AGAINST SIDE OF BLADE

Set Teeth of Circular Saws With Gauge Made from File

IT IS advisable to use a gauge of some kind when resetting the teeth of large hand saws or circular saws, to make sure that all teeth cut a channel of the same width. An old flat file is readily adapted to this purpose by bending the tip of the handle. When the file is placed against the saw with the bent tip toward the saw teeth, this tip should just barely touch the tips of the teeth when the saw is correctly used. There should now be no binding of the saw in its cut.—Thos. G. Chudy.

Weave this OLD CHIHUAHUA *Chair*

by HI SIBLEY

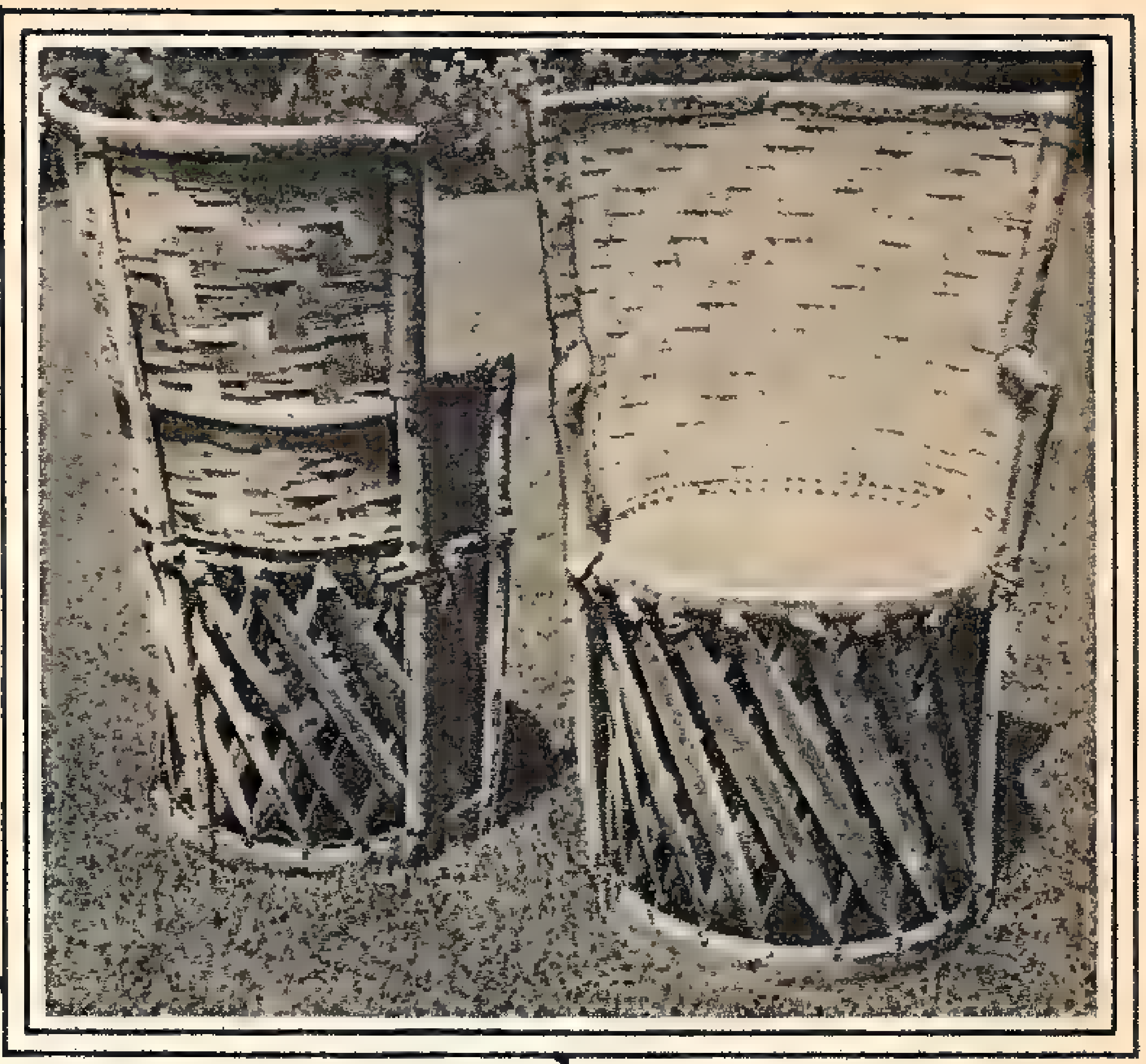
FROM old Chihuahua province, on the southern banks of the Rio Grande, comes this artistic as well as comfortable chair for your lawn, porch, or sun room.

Not a single nail or screw is used in the entire chair—these were unheard of in the days when some Mexican, or possibly an Indian, first worked out the simple design. Rawhide lacings hold the frame together, and form the springy covering for the seat.

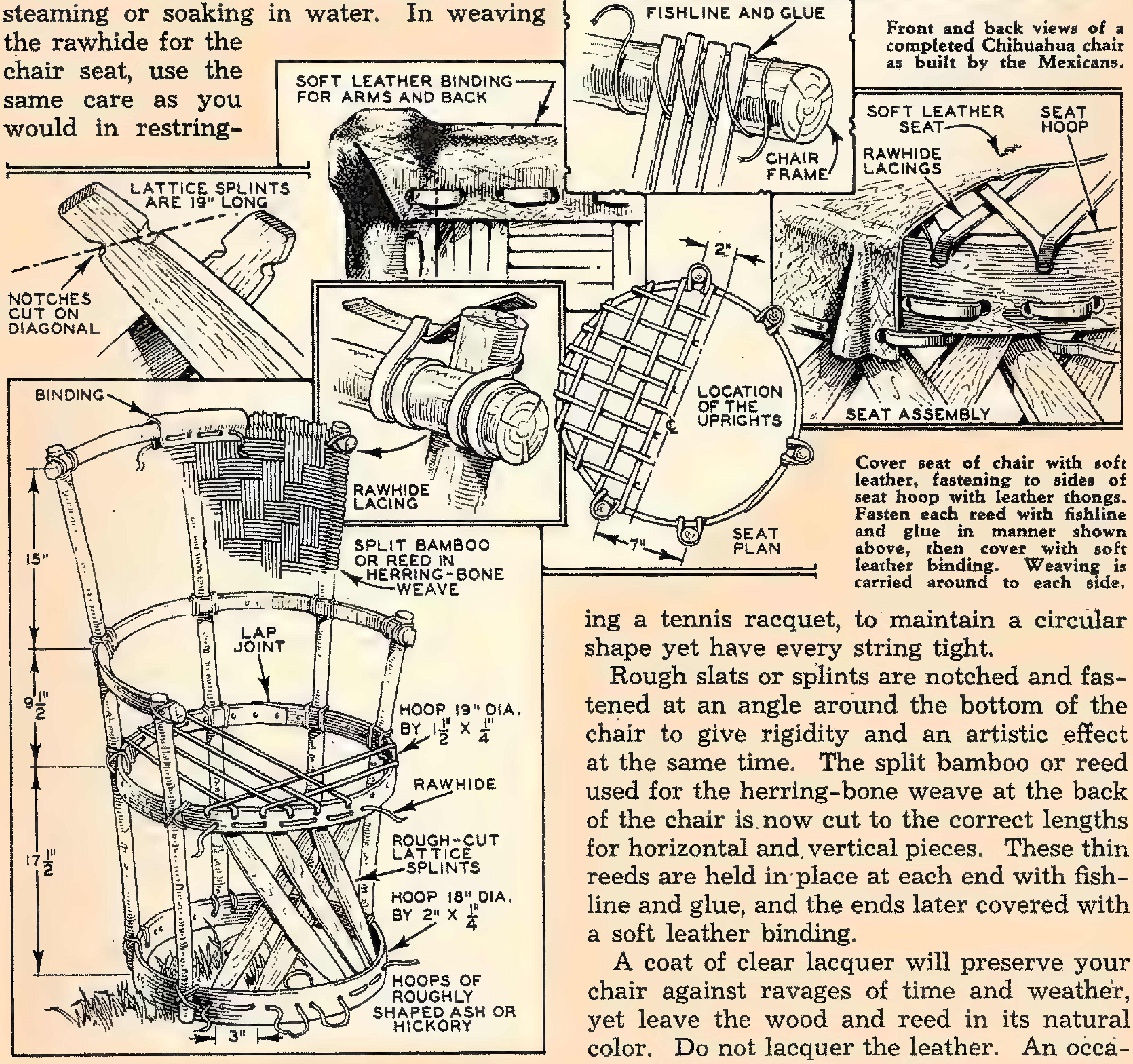
Select and gather your frame pieces first. For the vertical posts almost any American woods such as birch, oak, or ash saplings may be used once they are well seasoned. Hoops may be bent from ash or hickory slats by steaming or soaking in water. In weaving the rawhide for the chair seat, use the same care as you would in restringing a tennis racquet, to maintain a circular shape yet have every string tight.

Rough slats or splints are notched and fastened at an angle around the bottom of the chair to give rigidity and an artistic effect at the same time. The split bamboo or reed used for the herring-bone weave at the back of the chair is now cut to the correct lengths for horizontal and vertical pieces. These thin reeds are held in place at each end with fishline and glue, and the ends later covered with a soft leather binding.

A coat of clear lacquer will preserve your chair against ravages of time and weather, yet leave the wood and reed in its natural color. Do not lacquer the leather. An occasional oiling or rubbing with lard will be sufficient to keep the leather soft.



Front and back views of a completed Chihuahua chair as built by the Mexicans.

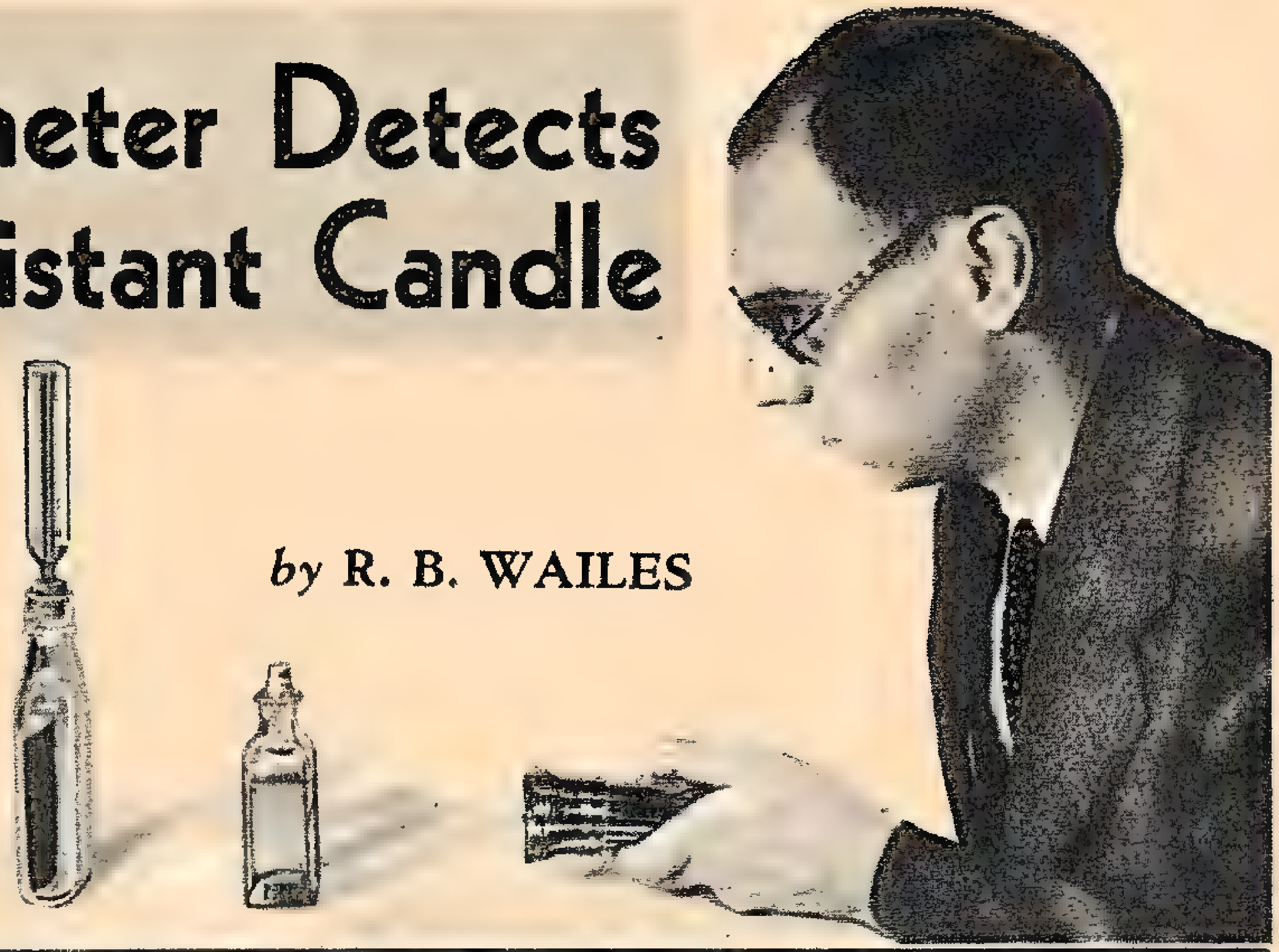

FISHLINE AND GLUE
CHAIR FRAME
SOFT LEATHER BINDING FOR ARMS AND BACK
SOFT LEATHER SEAT
SEAT HOOP
RAWHIDE LACINGS
LATTICE SPLINTS ARE 19" LONG
NOTCHES CUT ON DIAGONAL
2"
LOCATION OF THE UPRIGHTS
SEAT ASSEMBLY
7"
SEAT PLAN
RAWHIDE LACING
BINDING
SPLIT BAMBOO OR REED IN HERRING-BONE WEAVE
15"
LAP JOINT
9½"
HOOP 19" DIA. BY 1½" X ¼"
RAWHIDE
17½"
ROUGH-CUT LATTICE SPLINTS
HOOP 18" DIA. BY 2" X ¼"
HOOPS OF ROUGHLY SHAPED ASH OR HICKORY
3"

Cover seat of chair with soft leather, fastening to sides of seat hoop with leather thongs. Fasten each reed with fishline and glue in manner shown above, then cover with soft leather binding. Weaving is carried around to each side.

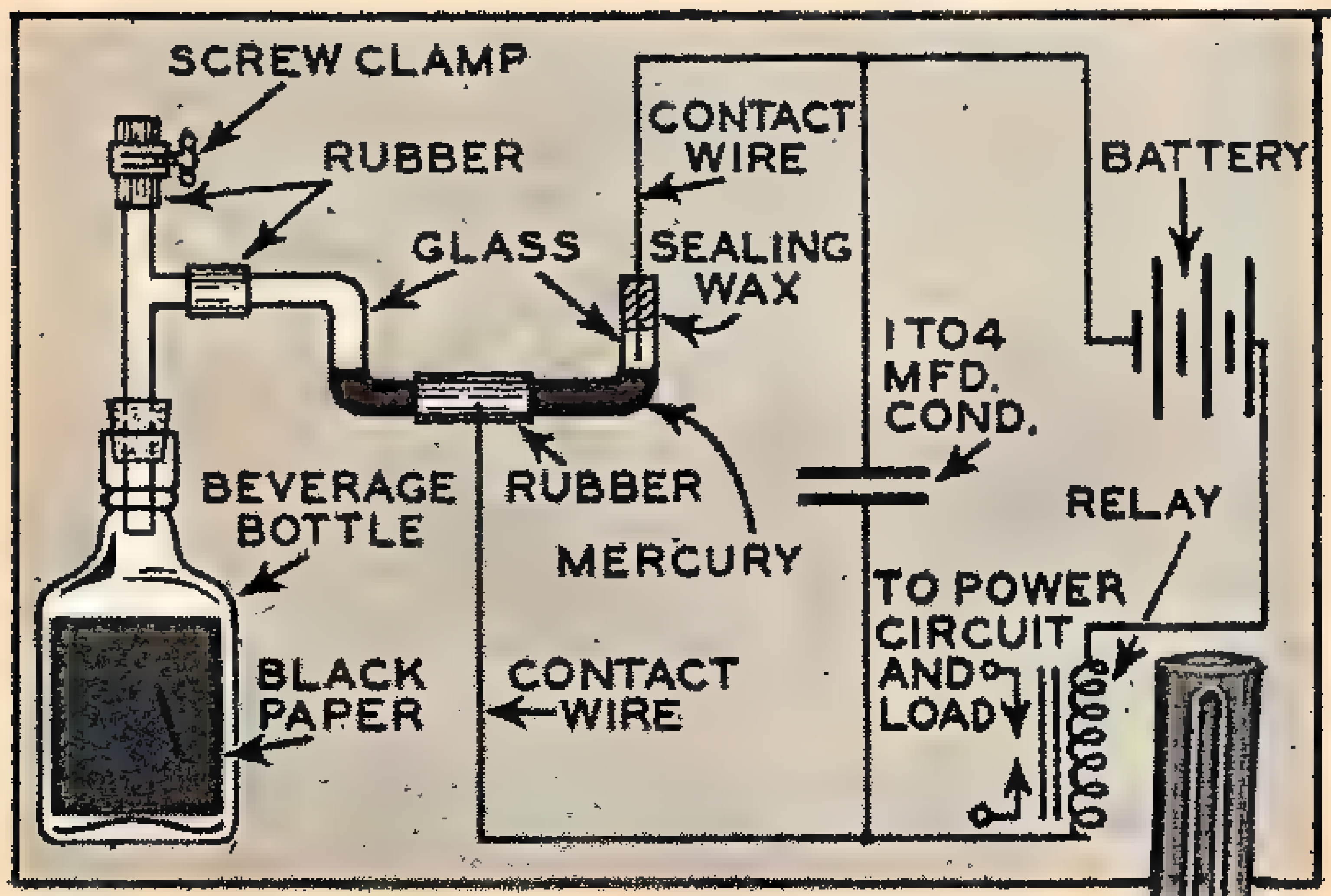
Fasten frame of chair together with leather thongs which have been soaking for several hours. Leather will shrink in drying, and hold pieces rigidly together. Use dry thongs for chair seat.

Gas Bolometer Detects Heat of Distant Candle

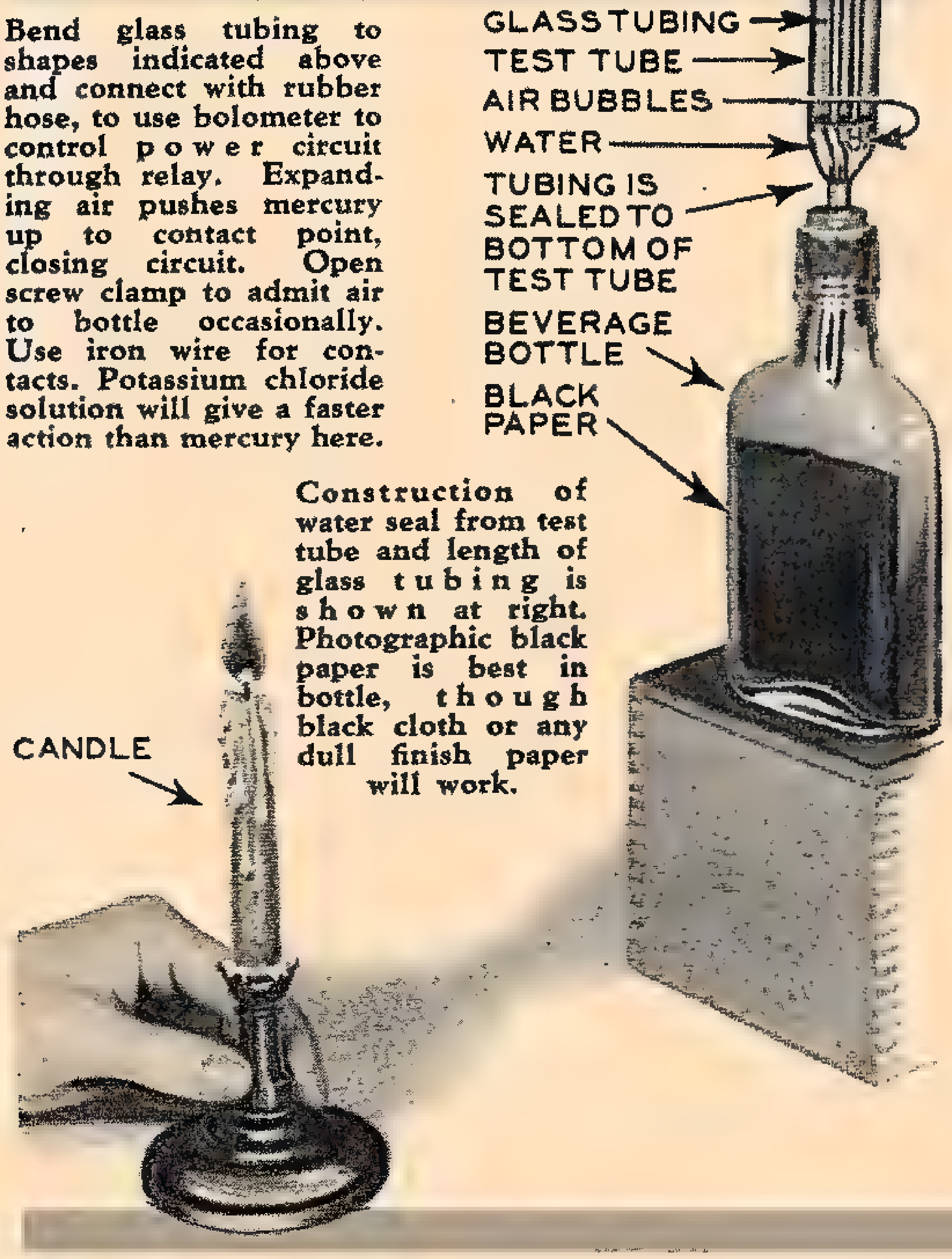
by R. B. WAILES



To tell whether certain transparent solutions will pass infra-red rays, place them in flat bottles in front of bolometer, shine flashlight through bottle on to bolometer, and watch for bubbles at water seal. Ferrous sulphate, copper sulphate, or potassium dichromate solutions do not allow the infra-red rays to pass.


SCREW CLAMP
RUBBER
GLASS
CONTACT WIRE
SEALING WAX
BATTERY
1 TO 4 MFD. COND.
BEVERAGE BOTTLE
RUBBER
MERCURY
RELAY
TO POWER CIRCUIT AND LOAD
BLACK PAPER
CONTACT WIRE

Bend glass tubing to shapes indicated above and connect with rubber hose, to use bolometer to control power circuit through relay. Expanding air pushes mercury up to contact point, closing circuit. Open screw clamp to admit air to bottle occasionally. Use iron wire for contacts. Potassium chloride solution will give a faster action than mercury here.


GLASS TUBING
TEST TUBE
AIR BUBBLES
WATER
TUBING IS SEALED TO BOTTOM OF TEST TUBE
BEVERAGE BOTTLE
BLACK PAPER
CANDLE

Construction of water seal from test tube and length of glass tubing is shown at right. Photographic black paper is best in bottle, though black cloth or any dull finish paper will work.

THIS little gas bolometer, operated by infra-red rays given off by any light source, will actually detect the heat from a candle or flashlight held ten feet away. By adding an electrical contact, the bolometer can be made to close a power circuit, operating a light bulb or alarm bell when light or heat is turned on in its vicinity. Requiring no batteries, it will be found very economical for use as a fire or burglar alarm.

A sheet of ordinary black paper inside the bottle absorbs infra-red rays, converting them into heat which expands the air in the bottle. This air escapes as a bubble through the water seal. The sensitivity of the instrument increases as the amount of water in the seal is diminished; it is not at all difficult to detect the presence of a lighted match five feet away by watching for bubbles.

The bolometer easily shows which transparent liquids and glass panes will pass infrared rays. A flat bottle filled with ferrous sulphate solution will pass visible light rays, but cut out the infra-red. Several drops of sulphuric acid added to this solution will keep it clear.

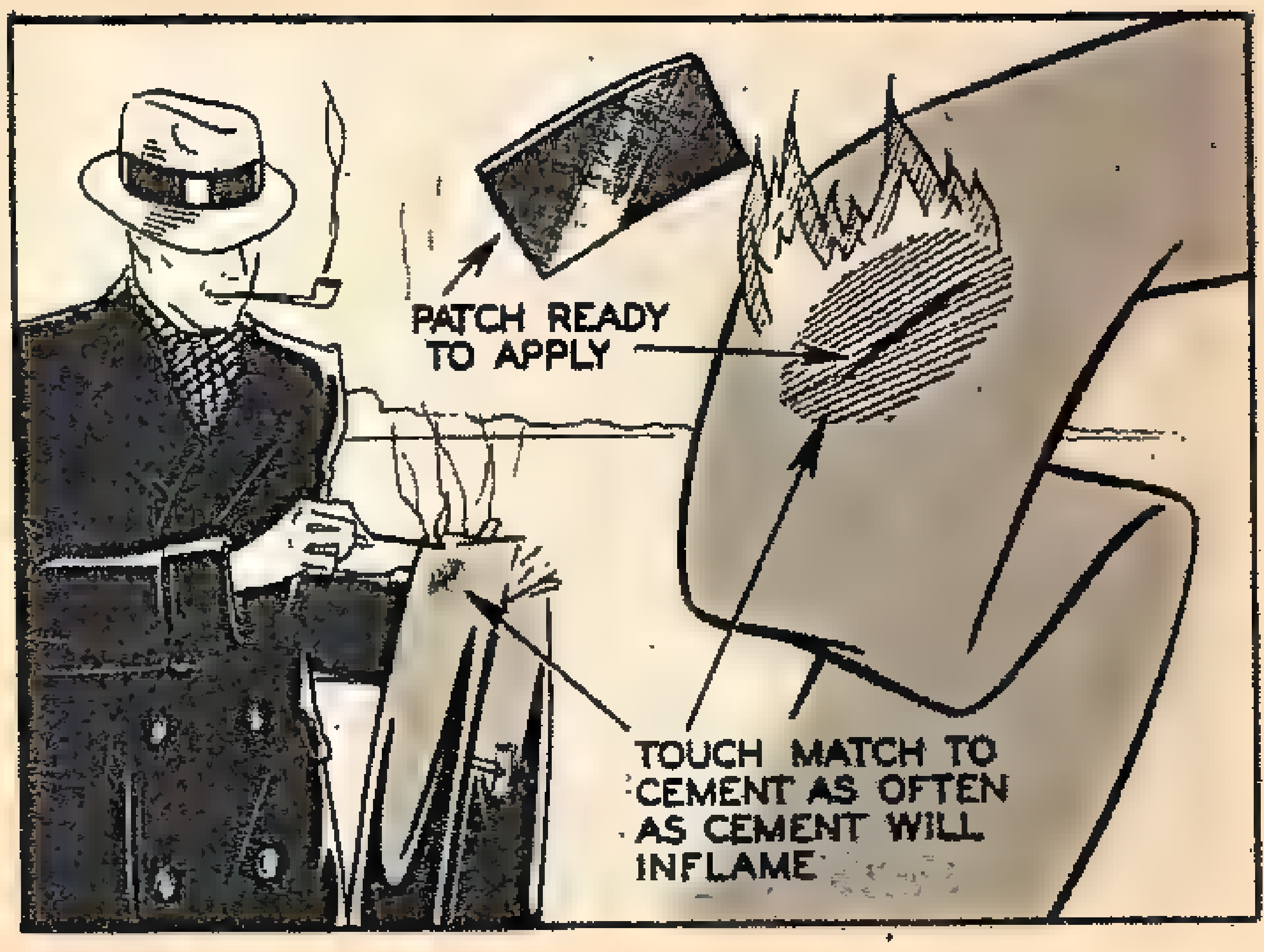
By placing a bunsen burner about a foot from the bolometer, you can easily demonstrate that a yellow flame produces more radiant heat than a blue flame. Bubbles will slow up or stop altogether when the burner air ports are opened to give a blue flame.

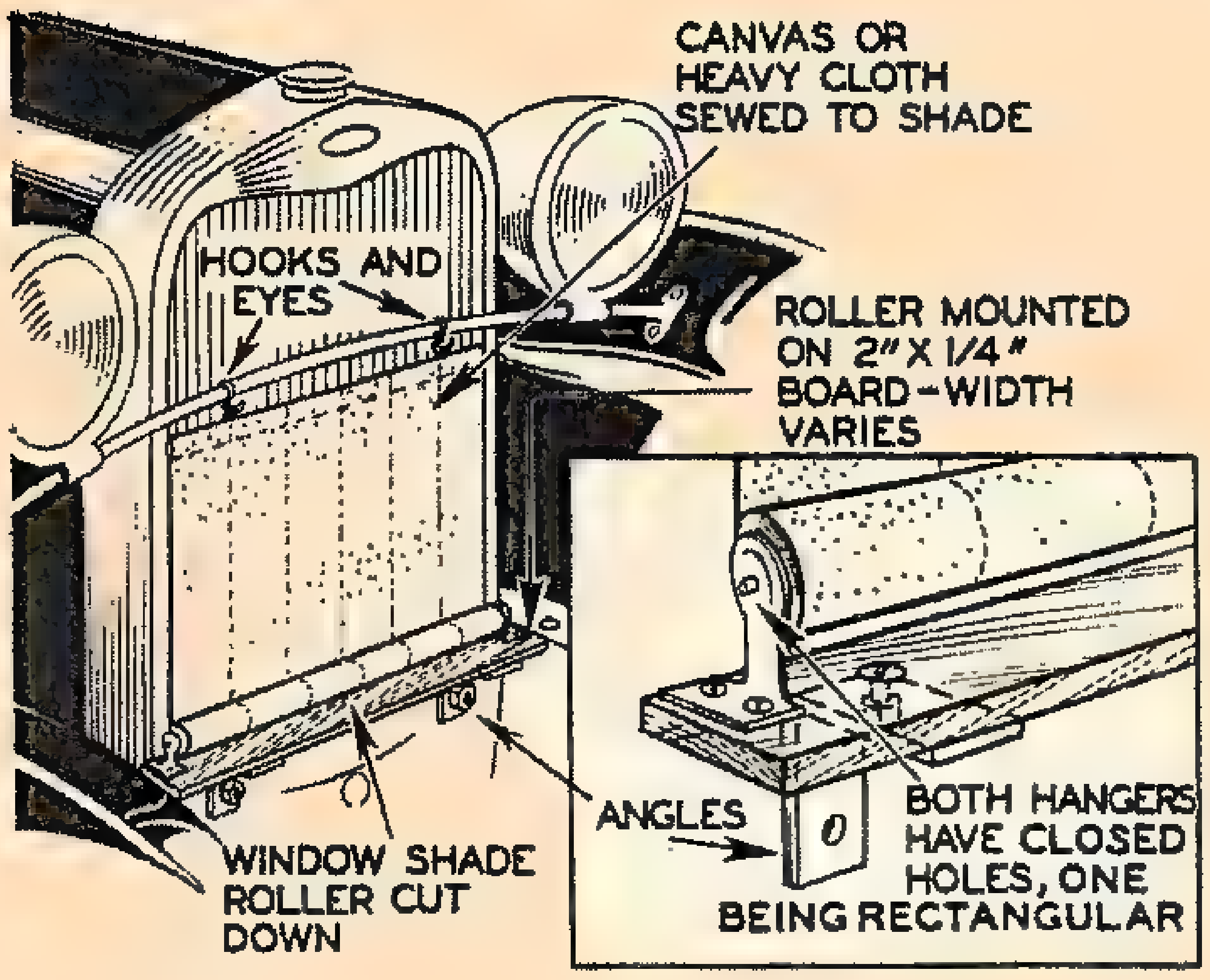
When making the electrical switch, use iron wire for the mercury contact. This will not tarnish in the rubber tube.

SIMPLE MOTORING KINKS

Heat Makes Inner Tube Patches Stick

WHEN the thermometer is hovering around zero, prepare inner tube patches in the usual manner, but touch a match to the cement as soon as it is applied. Blow out the flame immediately, and apply the match again, as often as the cement will burn. Then apply the patch quickly, and it will stick.—H. J. Olson.


PATCH READY TO APPLY
TOUCH MATCH TO CEMENT AS OFTEN AS CEMENT WILL INFLAME

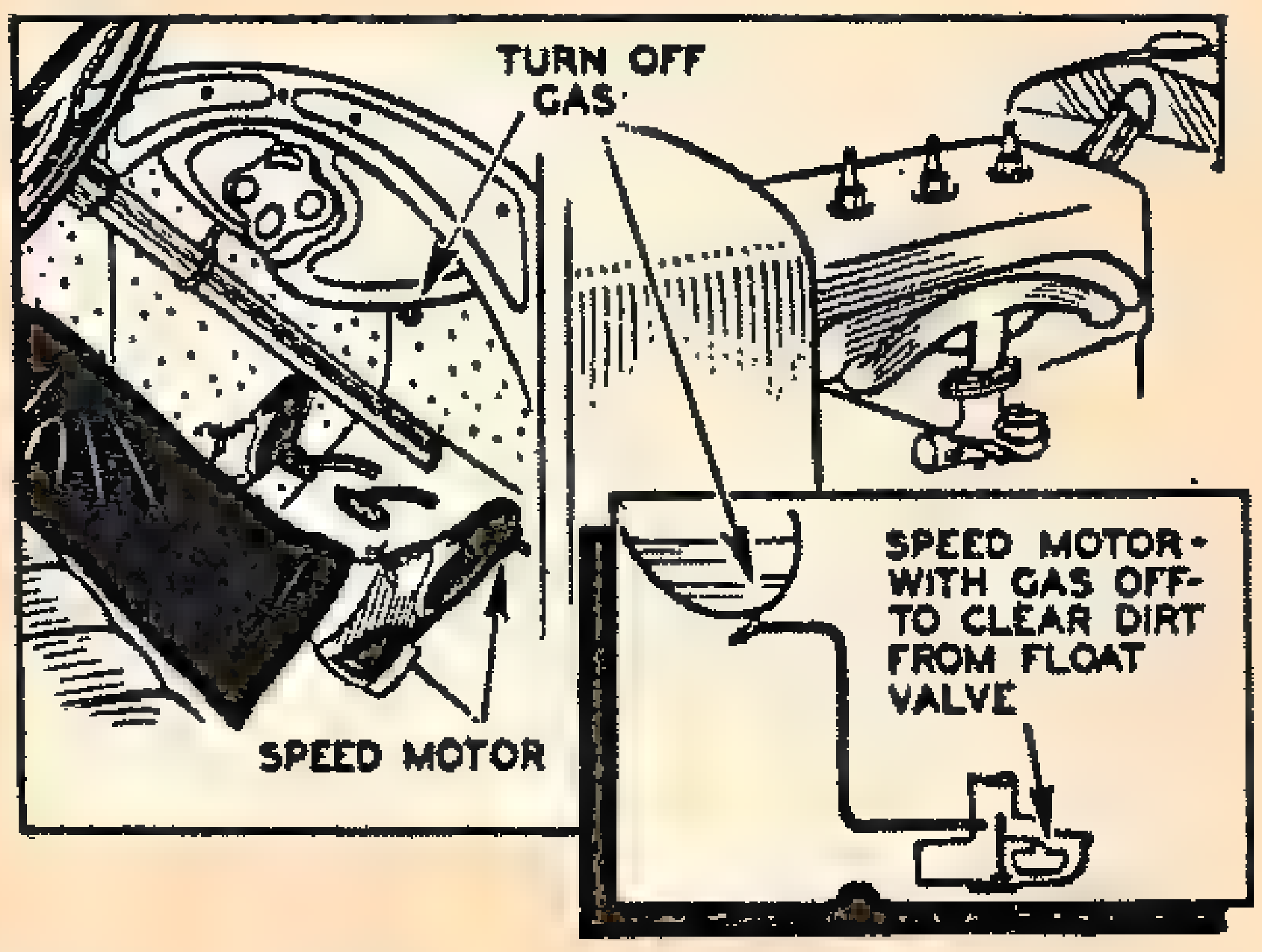

CANVAS OR HEAVY CLOTH SEWED TO SHADE
HOOKS AND EYES
ROLLER MOUNTED ON 2"X 1/4" BOARD-WIDTH VARIES
ANGLES
BOTH HANGERS HAVE CLOSED HOLES, ONE BEING RECTANGULAR
WINDOW SHADE ROLLER CUT DOWN

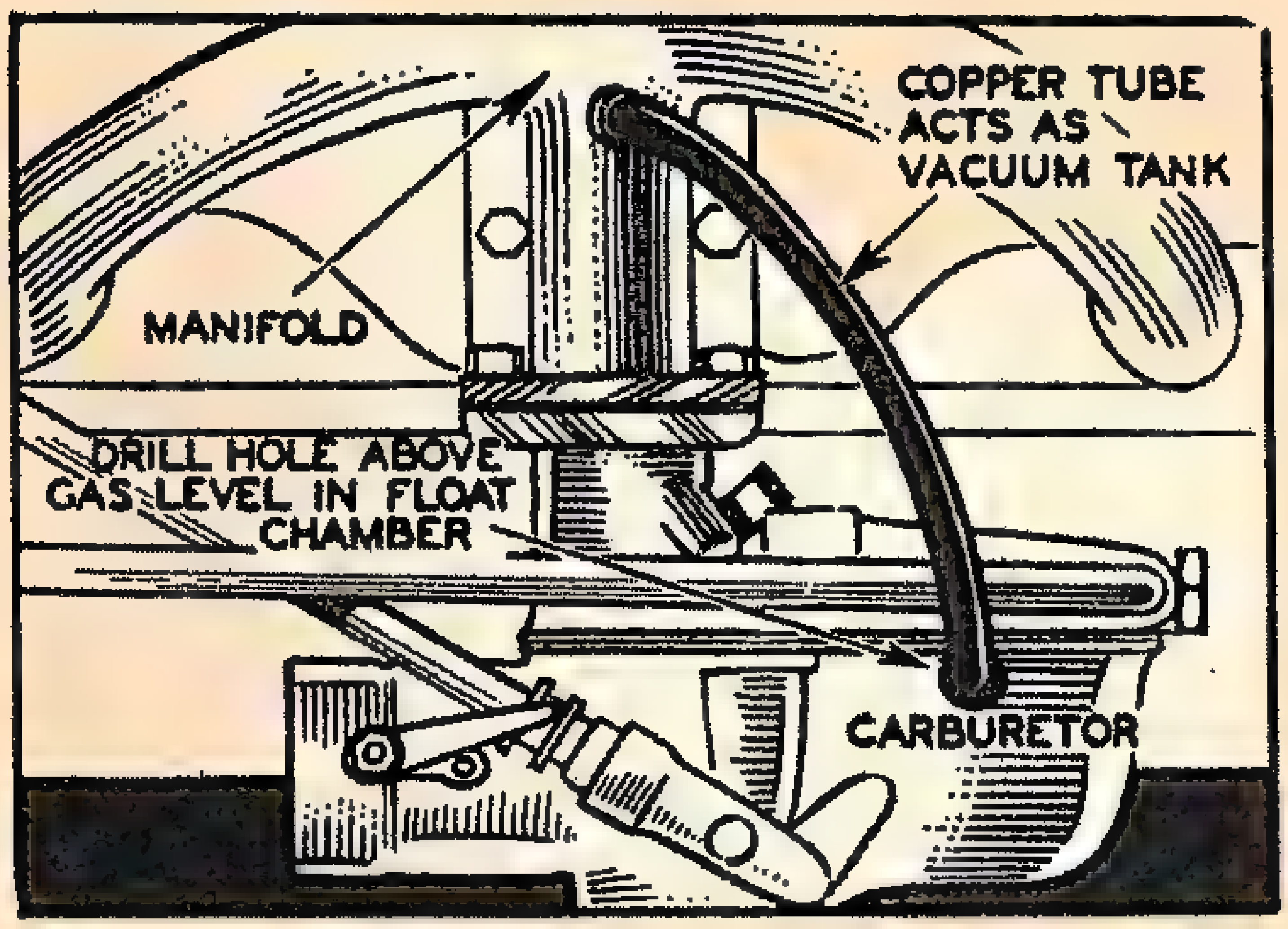
Use Roller Shade As Radiator Shutter

A CUT-OFF length of window shade on its roller makes an easily adjustable shutter for the auto radiator in winter. The shade cloth should be reinforced with a piece of canvas or heavy cloth. The spring tension keeps the cloth from flapping in the wind.—Vernon W. Palen.

Race Engine to Clear Dirt from Carburetor

WHEN dirt becomes lodged on the needle valve above the float of your auto carburetor, close the gas tank valve, then speed up the motor till gas in the carburetor is consumed. The vacuum created will usually suck up dirt particles.—J. M. Evans.


TURN OFF GAS
SPEED MOTOR
SPEED MOTOR-WITH GAS OFF-TO CLEAR DIRT FROM FLOAT VALVE

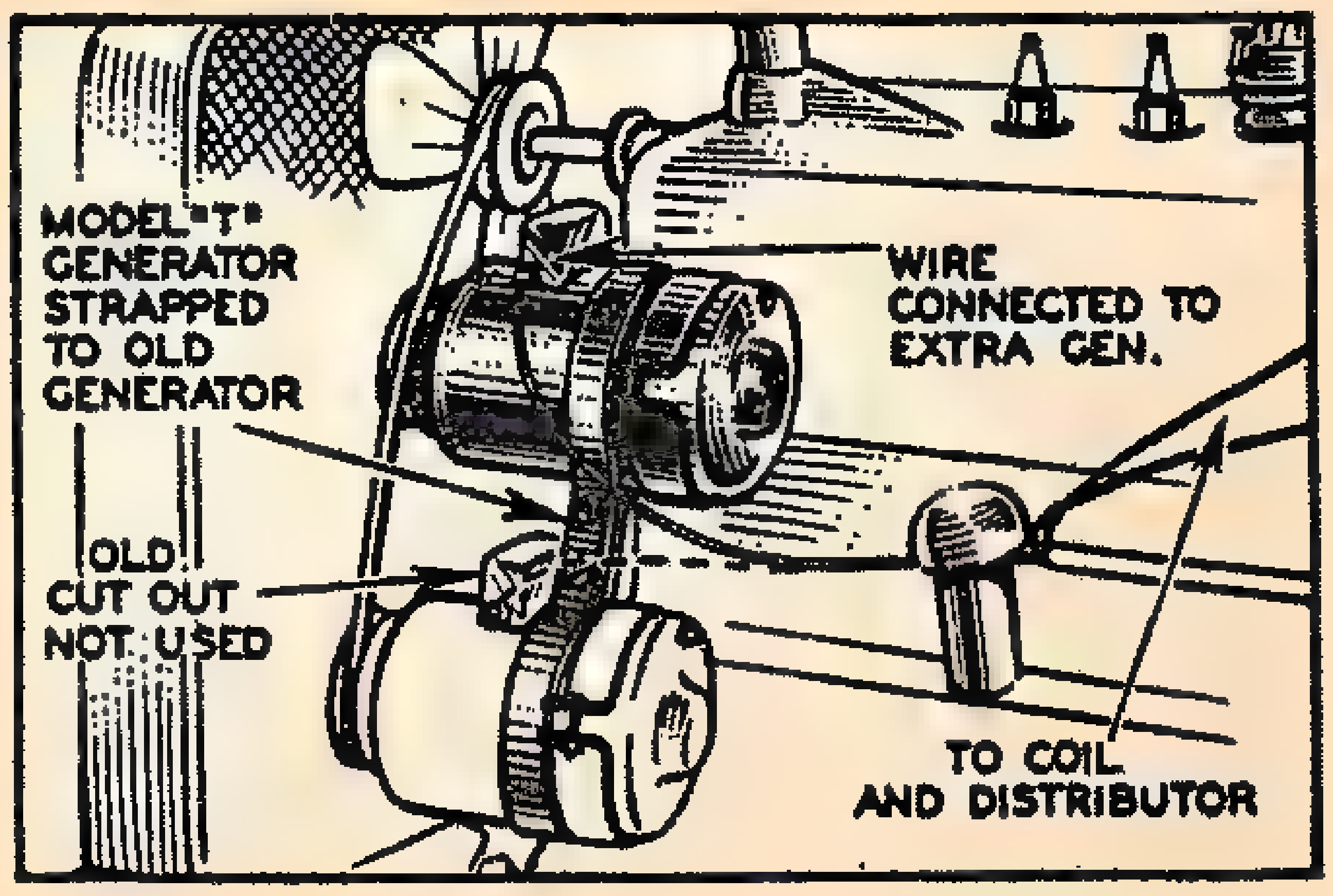

COPPER TUBE ACTS AS VACUUM TANK
MANIFOLD
DRILL HOLE ABOVE GAS LEVEL IN FLOAT CHAMBER
CARBURETOR

Ford Vacuum Tank

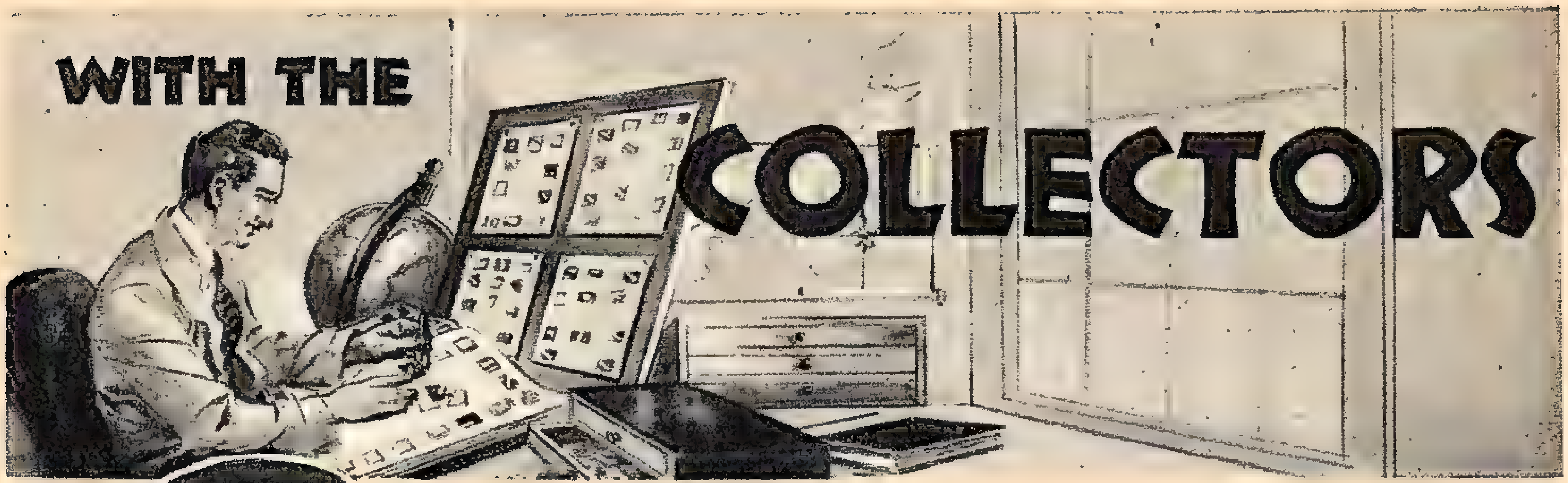
WITH gravity feed for gasoline as used on model T Fords, it is sometimes necessary to back the car up a steep hill when the gas supply is low. By installing a copper tube between the upper part of the intake manifold and the carburetor bowl the vacuum set up by the engine pistons on the intake stroke will draw gasoline from the tank to the carburetor.—H. M. Anderson.

Temporary Repair for Damaged Generator

WHEN the generator armature on your car engine burns out, or a short circuit occurs, a temporary repair can be obtained in a few minutes simply by strapping a model T Ford generator to your old unit, and driving it with the same fan belt as was used before. For a permanent mounting use a strap of iron.—R. Spencer.


MODEL "T" GENERATOR STRAPPED TO OLD GENERATOR
WIRE CONNECTED TO EXTRA GEN.
OLD CUT OUT NOT USED
TO COIL AND DISTRIBUTOR

WITH THE COLLECTORS



WIN $5.00 CASH FOR UNUSUAL HOBBY STORIES

WHETHER your hobby is the collecting of rolling pins, match boxes, wishbones from the Christmas day platters of famous men, or something even more unusual, tell us about it. If possible take snapshots of the collection, similar to those shown on this page. You will then have an excellent chance to win one of the $5.00 cash prizes offered each month for the most unusual hobby.

The story describing your collection should not contain more than 200 words. Even odd collections of stamps or coins may be entered. Send your entry to Hobby Editor, MODERN MECHANIX & INVENTIONS, 529 S. 7th St., Minneapolis, Minn. Be sure to include return postage if you want your snapshots and story returned.

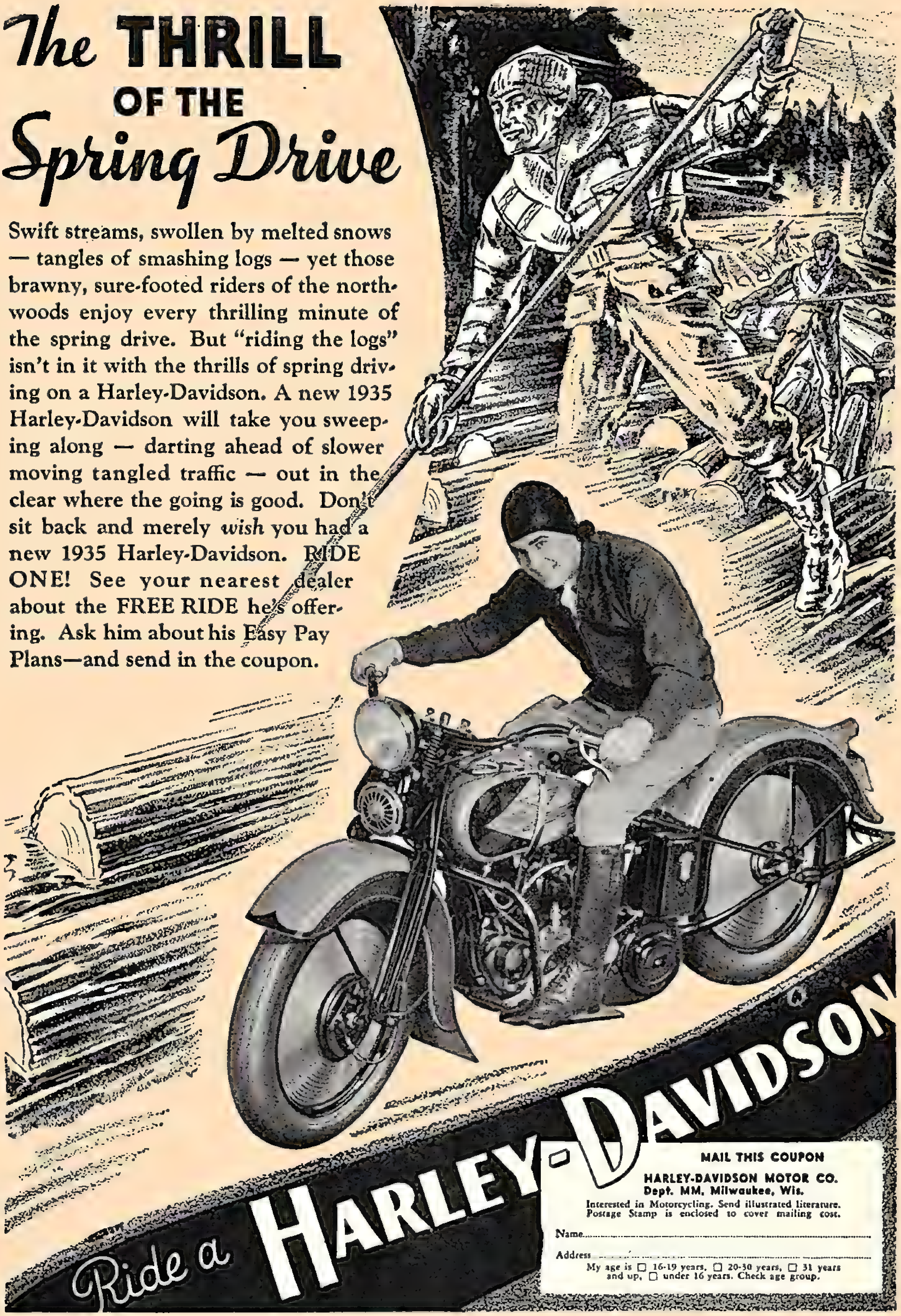
"Sailor's Bottles"—given to embarking sailors by sweethearts, to be tossed overboard with a last message of love, if ship met disaster, are gathered by Lerna Kelly of Long Beach, California. S. Wixon of the Battleship Utah holds two of the ornate colored glass bottles.

From every corner of the United States came this armful of pocket matches. Collectors the world over gather these colorful advertising packets, then trade with each other to build up collections. Your own match packet collection, photographed, may bring $5 in MM's hobby contest.

The collecting of salt shakers may not seem to offer any possibilities as a hobby, but Louis C. Gulley, retired postal clerk of Venice, California, has 1,520 different specimens of them in his collection. He is holding bamboo cane once owned by Aguinaldo, Philippine insurrectionist. Have you a more unique hobby than this?

The THRILL OF THE *Spring Drive*

Swift streams, swollen by melted snows — tangles of smashing logs — yet those brawny, sure-footed riders of the northwoods enjoy every thrilling minute of the spring drive. But "riding the logs" isn't in it with the thrills of spring driving on a Harley-Davidson. A new 1935 Harley-Davidson will take you sweeping along — darting ahead of slower moving tangled traffic — out in the clear where the going is good. Don't sit back and merely *wish* you had a new 1935 Harley-Davidson. RIDE ONE! See your nearest dealer about the FREE RIDE he's offering. Ask him about his Easy Pay Plans—and send in the coupon.



MAIL THIS COUPON

HARLEY-DAVIDSON MOTOR CO.
Dept. MM, Milwaukee, Wis.

Interested in Motorcycling. Send illustrated literature. Postage Stamp is enclosed to cover mailing cost.

Name..

Address...

My age is ☐ 16-19 years, ☐ 20-30 years, ☐ 31 years and up, ☐ under 16 years. Check age group.

ADLETS FOR HOBBYISTS

STAMPS

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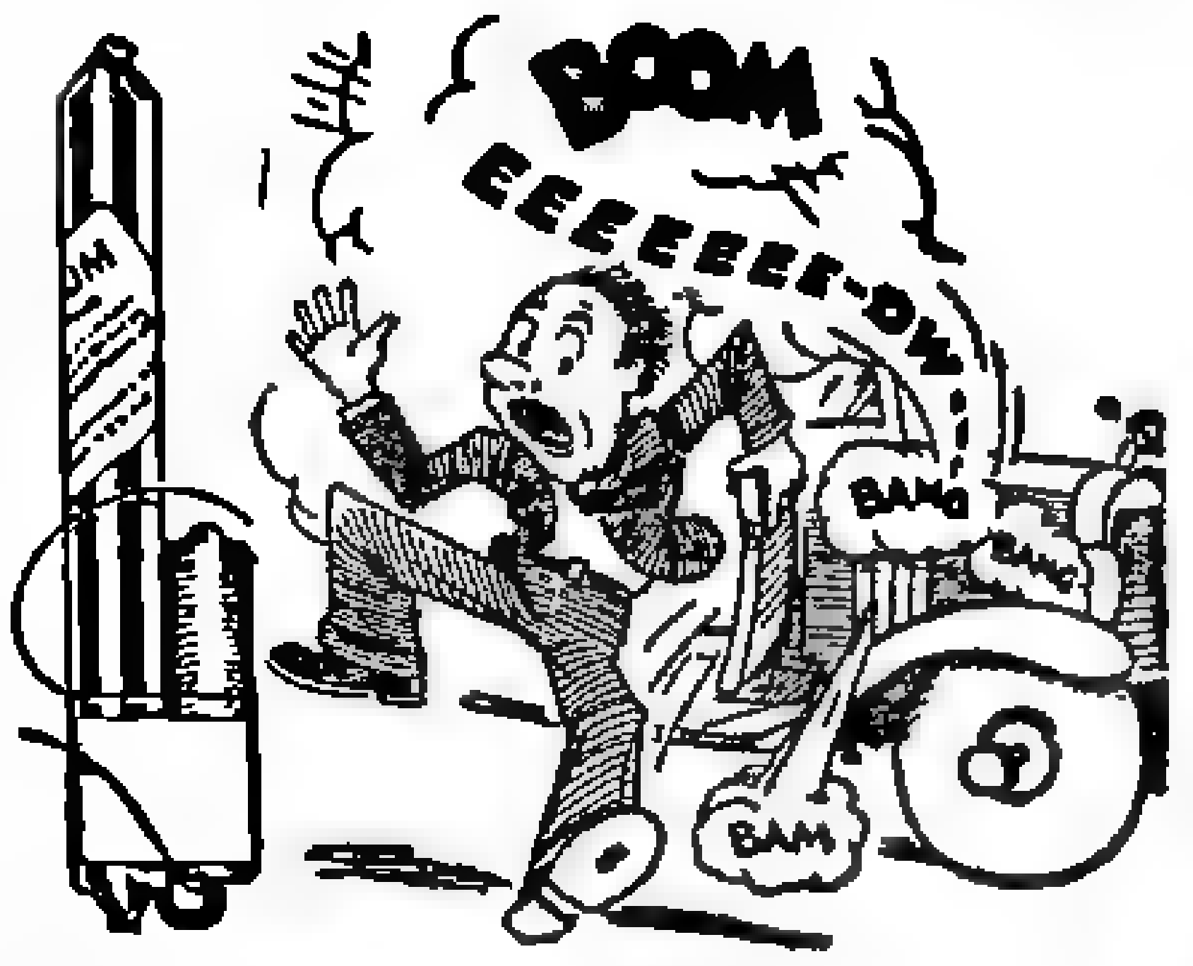

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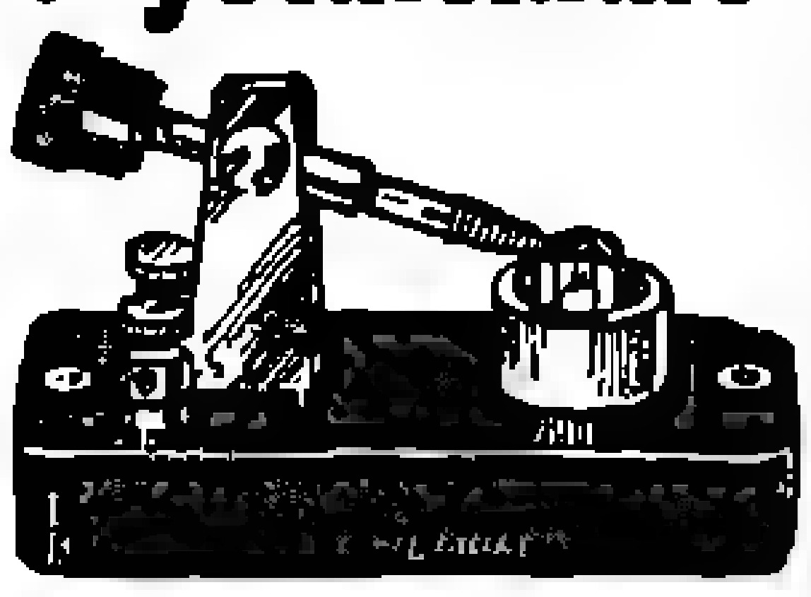

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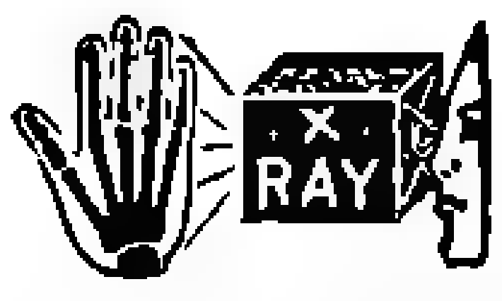

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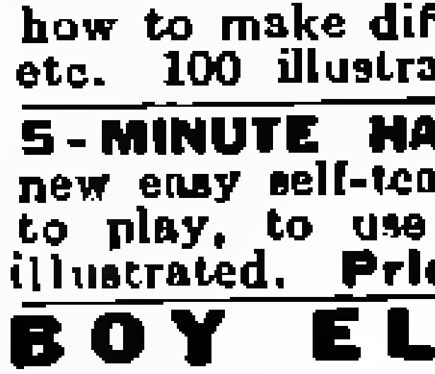

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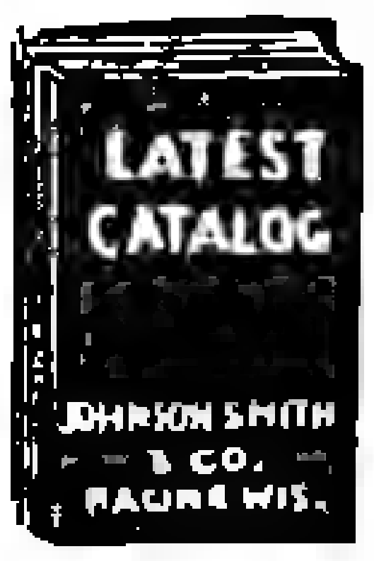
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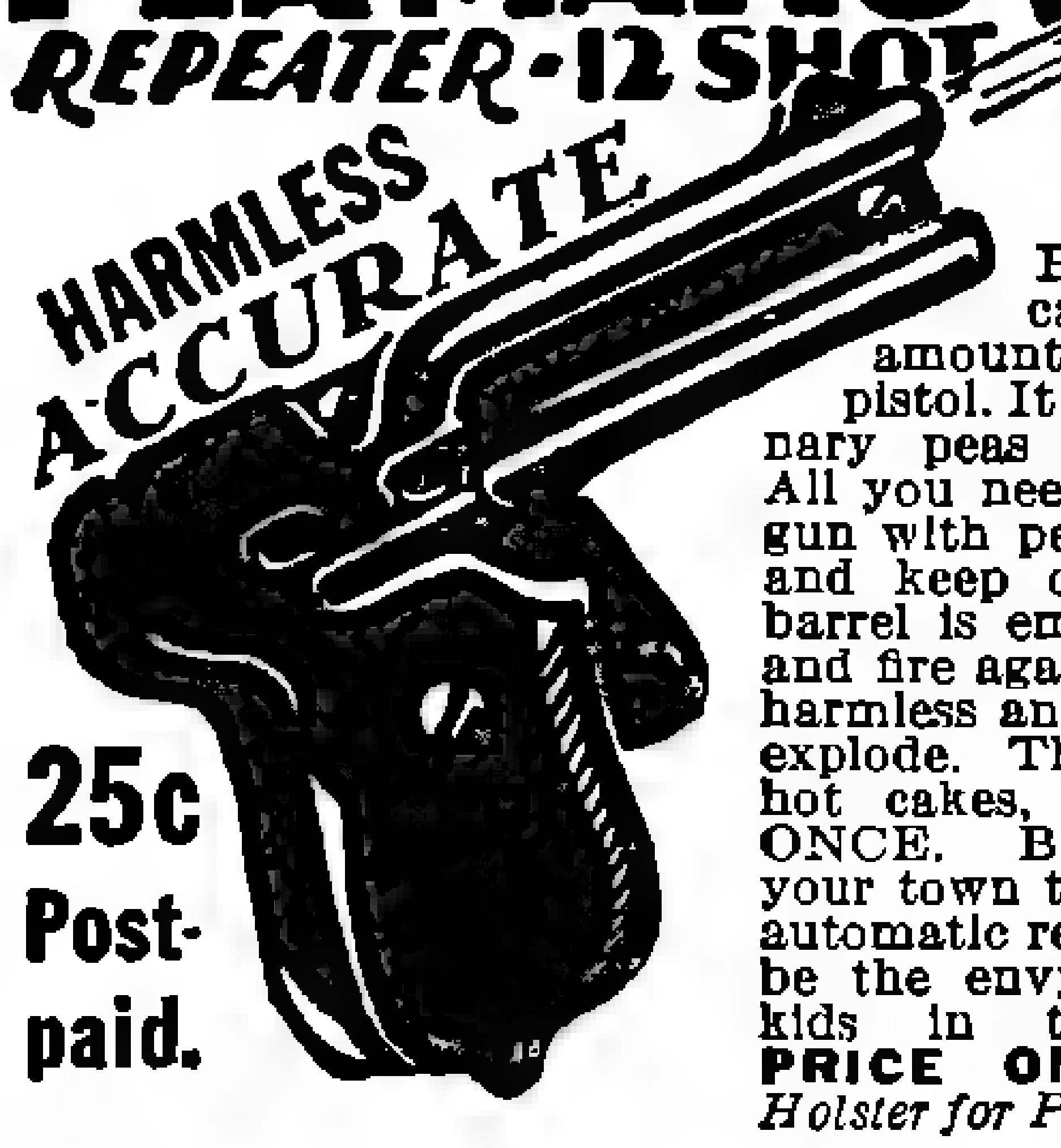

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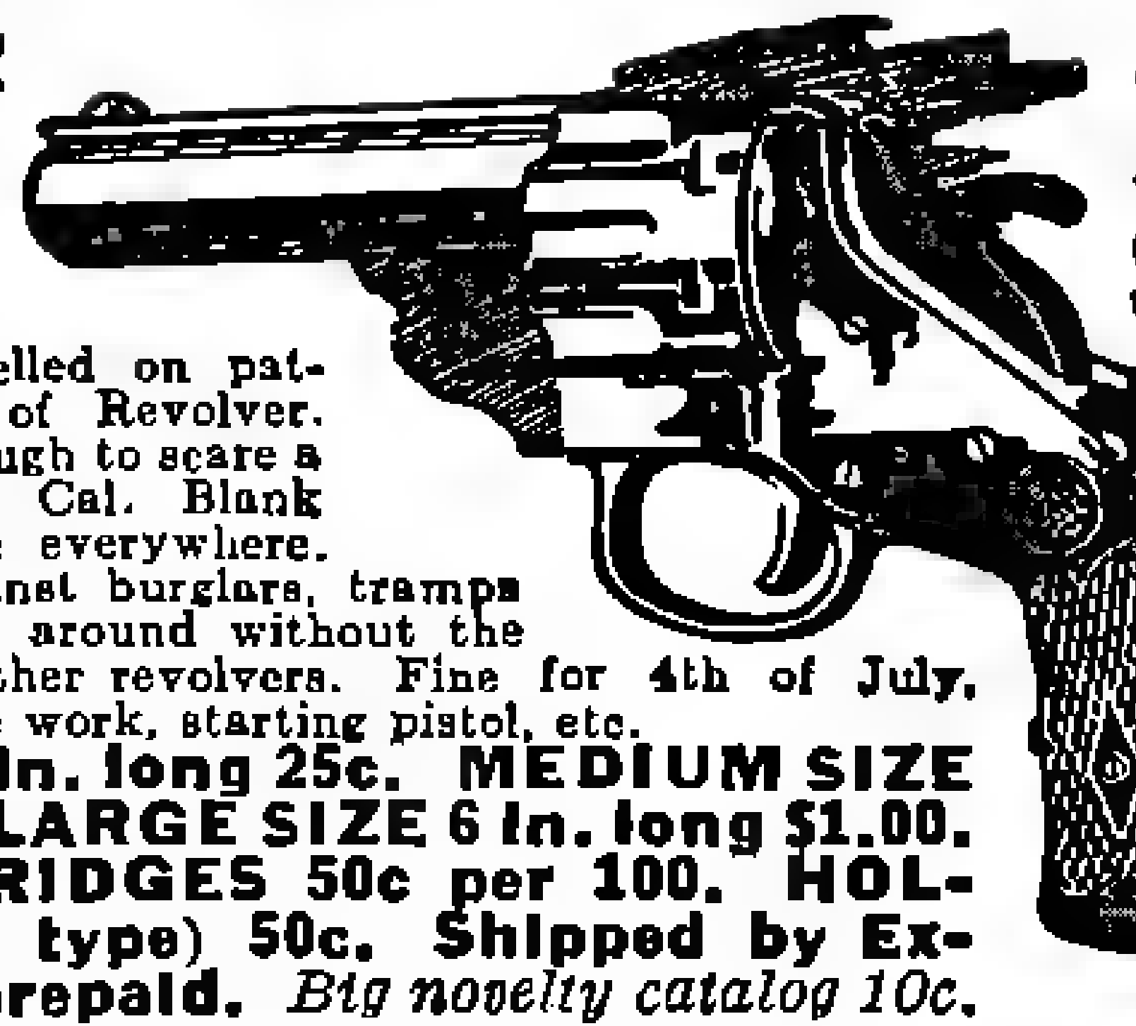

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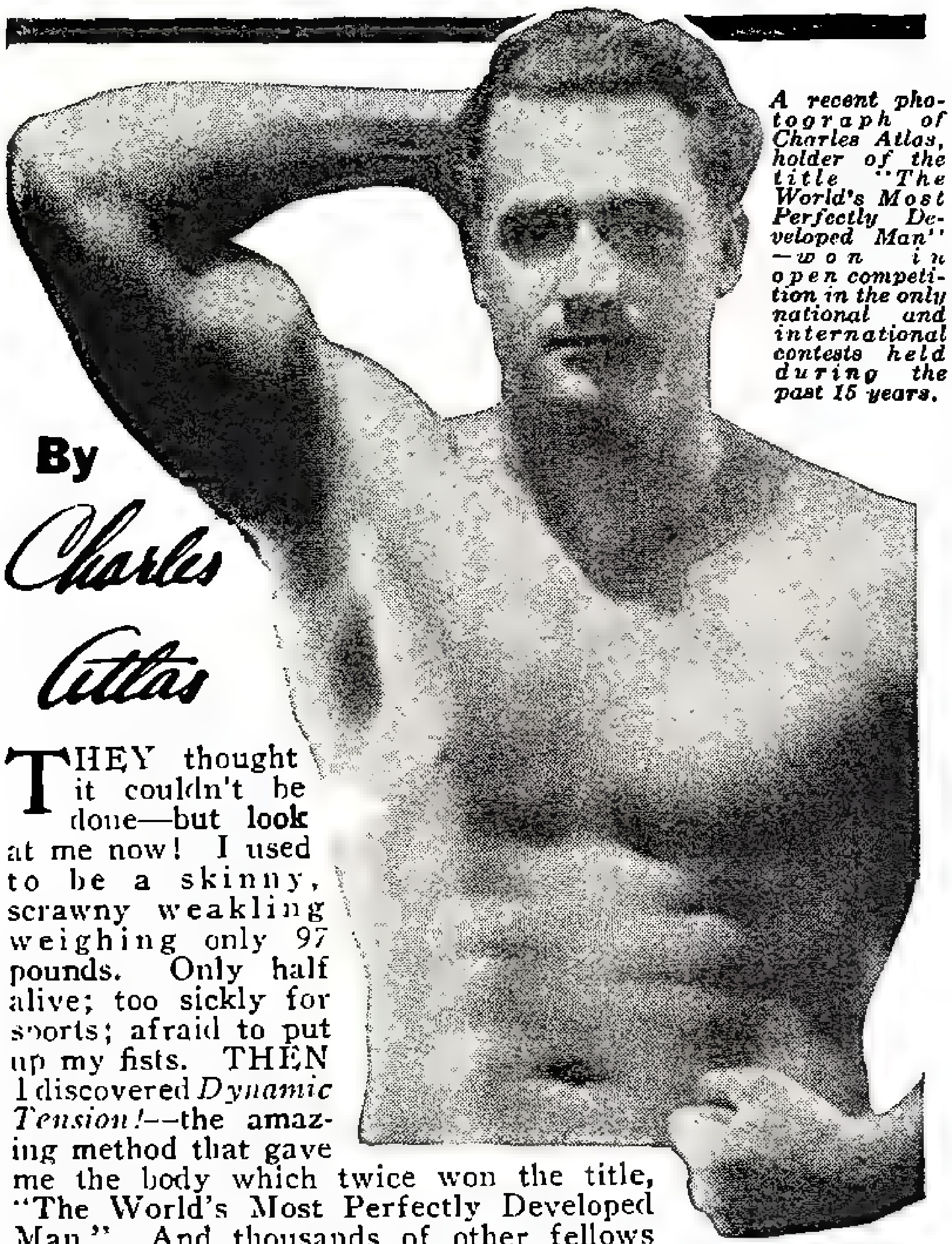

A recent photograph of Charles Atlas, holder of the title "The World's Most Perfectly Developed Man"—won in open competition in the only national and international contests held during the past 15 years.

By Charles Atlas

THEY thought it couldn't be done—but look at me now! I used to be a skinny, scrawny weakling weighing only 97 pounds. Only half alive; too sickly for sports; afraid to put up my fists. THEN I discovered *Dynamic Tension!*—the amazing method that gave me the body which twice won the title, "The World's Most Perfectly Developed Man." And thousands of other fellows who have put my secret to work are today the envied, he-men LEADERS in any crowd!

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Unfolding Mysteries of Boat Plans

[*Continued from page* 109]

In laying down the lines a smooth floor is selected, and either painted white or covered with building paper to form a surface to draw on. The first line drawn is the base line, which is made an absolutely straight line by stretching a string about two inches above the floor and projecting down to the floor with a square. The marks are made at the heel of the square at about three foot intervals, and connected with a straight-edge.

The station lines are now measured off according to the architect's plan, and laid out at right angles to the base line. Sometimes floor space is limited and one plan must be laid down over another. In other words the plan and profile are superimposed, using the base line as the centerline of the plan. This has its advantage, in that it makes projection from one to another easier. Usually the two plans are laid down atop one another using different colored pencils to distinguish them.

Draw Curves With Batten

To draw the curves properly we will need a *batten* or stick a little longer than the boat and about three-quarters of an inch square. If there are any very sharp curves in the boat a couple of battens about three eighths or a half inch square will come in handy. When the architect's offsets for a certain line are marked on the floor a batten is run through the points by driving a nail into the floor on each side of the strip as shown in Fig. 7. Never nail through a batten; an unfair line may result as the nail will not allow a natural curve.

If any spot in the line appears unfair draw a nail and allow the wood to take a natural curve. The architect's lines are laid down to a very small scale; each mistake is multiplied 12 to 16 times on your full-size layout. All lines must produce *fair* or graceful curves in profile, plan and body plan. If they fail to do so the lines are altered by a trial and error method until they do.

Subtract Thickness of Planking

After our lines are laid down and checked, the job of making the various timbers is the next step in the construction of our boat. As we said before, most lines of wooden boats are drawn to the outside of the planking and the first step in making moulds and timbers is to "take off the plank." There are various methods used in doing this. In straight sectioned boats the simplest method is to nail a square stick the exact thickness of the plank on the inside of our line on the floor and build the frames directly against this.

Where curves occur in the section lines the process is a little more complicated. One method is to draw a line parallel to the line from which we wish to make the timber and pick this up, as will be described later. Another method is to tack a series of small blocks of the same planking thickness inside the line and build against these blocks. The inside of the planking is generally termed the "moulded line."

The stern end of the boat, known as the *transom,* is seldom perfectly perpendicular, and does not show in its true shape on the lines plan. A projection must be made from the lines to get its true shape, as shown in Fig. 9. This is called *projecting the transom.*

Cut Keel and Stem From Full Size Plans

It is perfectly possible to cut all the rabbet lines of the keel and stem from the lines as laid down on the floor. Fig. 10 shows how this is done.

Next to taking off the shapes of timbers on the floor comes the difficult part of shaping the planking to fit the job. Where the edges of the planks are curved it will be necessary to fit each plank individually. The method of picking up these shapes is termed *spiling.* There are three methods by which this operation can be accomplished, all of them employing a thin board termed a *spiling board* or batten, which is allowed to lay on the frames with absolutely no edge spring. In other words it must lay in its natural tendency on the framing.

Transferring Curves With Dividers

The first method, and that most generally used, is to set the board as close as possible to the edge of the line to be fitted to. With a pair of dividers set to a little more than the greatest gap in the space between the spiling board and the line to be fitted to, a series of prick marks is set up all the same distance away from the line. Be sure that all prick marks are taken at right angles to the line to be fitted to. Mark all of your tick marks with a piece of chalk and rub these off the board when you have transferred the line.

Another method of using the spiling board is to tack a series of sticks to the spiling board so that their edges will be on the line to be fitted to. The spiling board is then removed and the shape transferred to the plank.

Yet another method is to draw a series of random lines on the spiling board and measure along these lines to the line to be fitted to. The measurements are then transferred to the plank.

In laying down the lines of any boat be sure to hold as close as humanly possible to the architect's plan. He has designed the lines to have certain curves with a definite purpose in mind; any big alteration may upset the performance of the boat.

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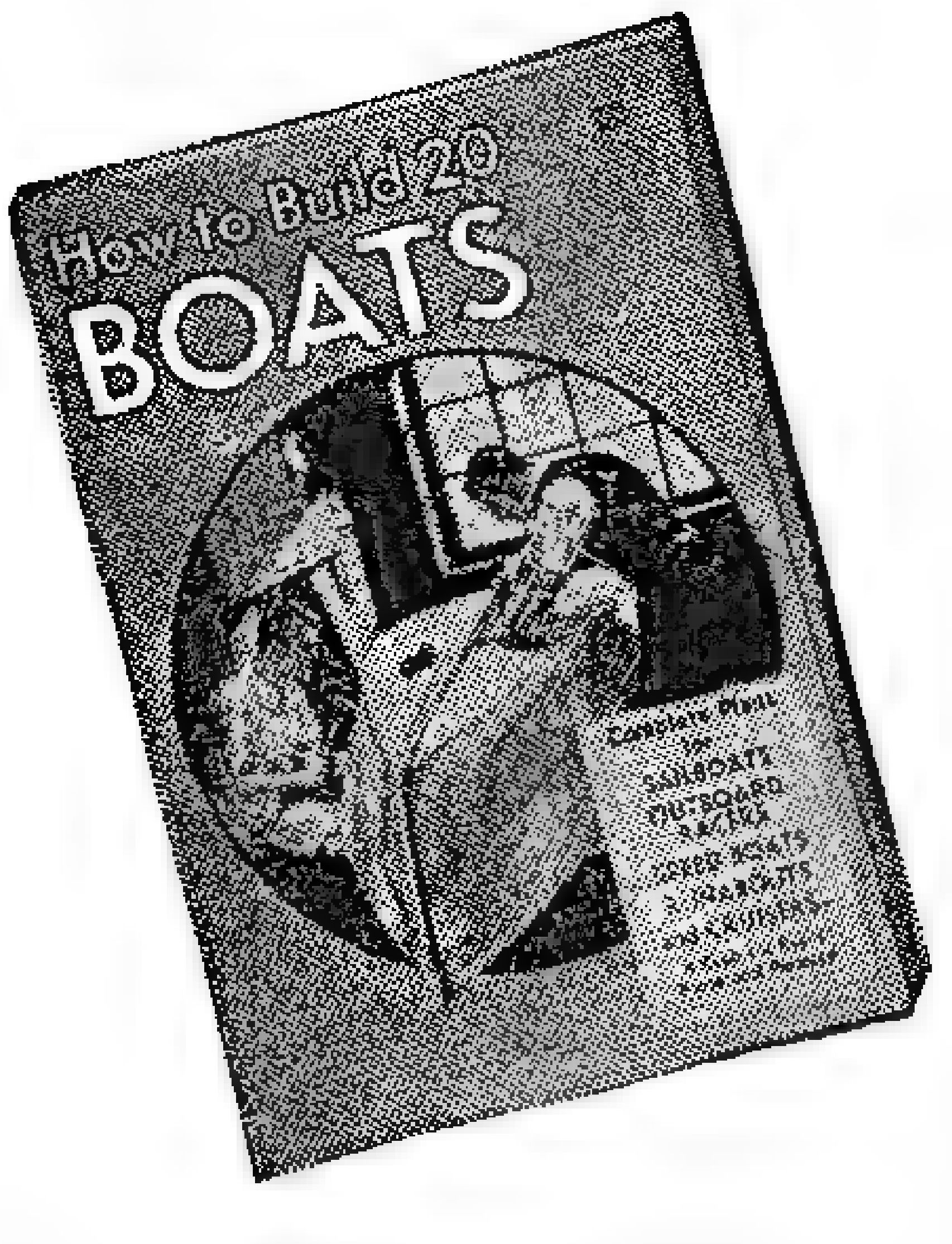

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Mold Plaster Novelties With Gelatin

[*Continued from page* 98]

the inside surface with ordinary raw linseed oil. Use about ¾ cup of cold water to each cup of molding plaster when mixing, to make a thick, creamy mixture which will level itself when poured. Fill the mold level full, allow to set a few minutes, then smooth off the top surface with a trowel or large knife.

Allow about one-half hour for the plaster to set, then remove the mold. The mold can be used over and over again, regreasing each time.

Allow the plaques to dry for several days, then fill up the pores in the plaster with a coat of ordinary shellac, white lacquer, or white enamel. Oil paints can now be used in finishing the product in color.

Information on where you can get the materials needed in flexible molding will be sent you, if you are unable to purchase these in your vicinity. Address Problems Editor, MODERN MECHANIX & INVENTIONS, 529 S. 7th St., Minneapolis, Minn.

How I Judge Championship Fights

[*Continued from page* 49]

5. Total points. Now I shall explain the purport of each classification. Aggressiveness, in the first column, does not necessarily mean walking blindly into the other man or charging helter-skelter into an opponent. In this respect, we must consider aggressiveness of mind as well as body. Too often, a boxer is feinted into a lead with disastrous results.

Solar Plexus Punch Is Effective

In most cases, however, aggressiveness is best measured by a boxer's eagerness and ability to give the fans a good return for their investment. If he is continually pressing the fight with good results, there is little question but that he must be given due credit.

Clean, effective punches can only be delivered with the closed fist, knuckles foremost. This is the phase of scoring a boxing match which is most deceptive to the fan whose view of the fight may be impaired either by distance or the presence of some obstacle. To the referee in the ring there is seldom any doubt about the legality or effectiveness of a punch. But to the man in the 25th row, a punch that may be deflected off an opponent's shoulder or head ofttimes appears to be one of an effective nature.

Rabbit punches are not clean blows, because they are delivered to the back of the neck with the lower edge of the hand. Punches most effective are those delivered under the heart, under the liver and to the solar plexus. A blow delivered under the heart is damaging, particularly if repeated several times. It wears an opponent down. Punches delivered under the liver bring excruciating pain. The solar plexus punch to the pit of the stomach is always effective, cutting the wind supply and sapping an opponent's strength.

In the second column we find sportsmanship and deportment. Here we consider a boxer's adherence to such rules as require a man to walk quickly to the farthermost corner after a knockdown, to cease hitting after the bell, to obey the referee, and to use proper language.

In the third column, we must consider the cleanliness of a knockdown as well as its effect on the recipient. A knockdown which is the result of a half-slip or a push is never as effective as one which is the direct result of a clean punch. In the system of scoring by rounds, a man may automatically lose the round in which he has been knocked down; using the point system he may lose only two or three points and retain some recognition for creditable work before or after the knockdown.

In the fourth column, we award points to a contestant when his opponent breaks the rules. There are minor fouls such as flicking —hitting with the open glove—rabbit punching, use of the elbows, use of the head or poking a thumb into an opponent's eye.

Low Punches Are Seldom Intentional

The low punch is the most flagrant of fouls. But even this, in the light of equipment a boxer is required to wear today, seldom seriously injures the man on the receiving end. Automatically, a man who delivers such a blow must lose the round in which it occurs, but the scoring system has such flexibility that he may go on to redeem himself. I am quite sure that most low blows are unintentional, anyhow, and that the tendency is to overestimate their importance.

What I particularly like about this system of scoring is that it is sufficiently elastic to permit a man to come from behind to rectify mistakes he may have made early in the bout. It also substantiates my theory that things which happen early in a fight are just as important as those which occur in late rounds.

I think the tendency is to credit a boxer too much for a strong finish after he has done a poor job of the early rounds. We forget too easily the things that happened early in the fight. In the Illinois scoring system these things are recorded in black and white and cannot be erased.

From time to time there have been suggestions that the two judges be eliminated. This practice, I believe, would do no good. The

[Continued on page 143]

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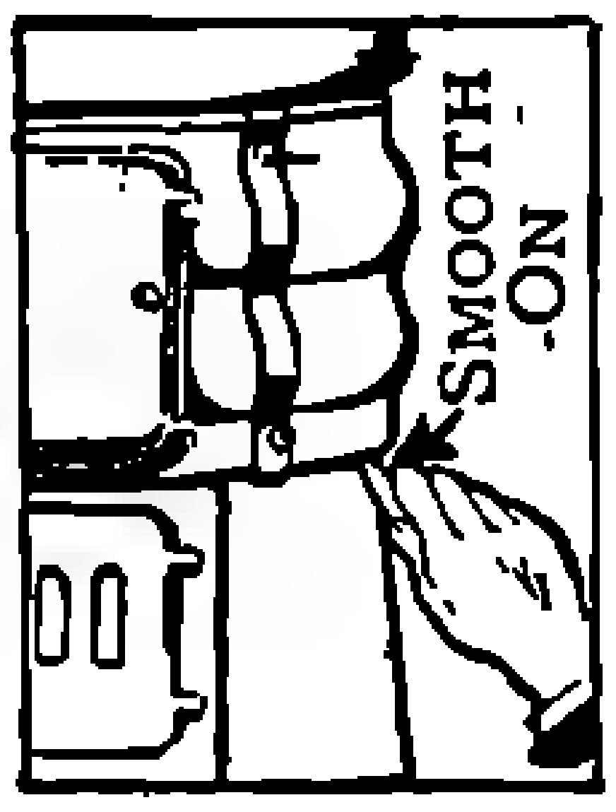

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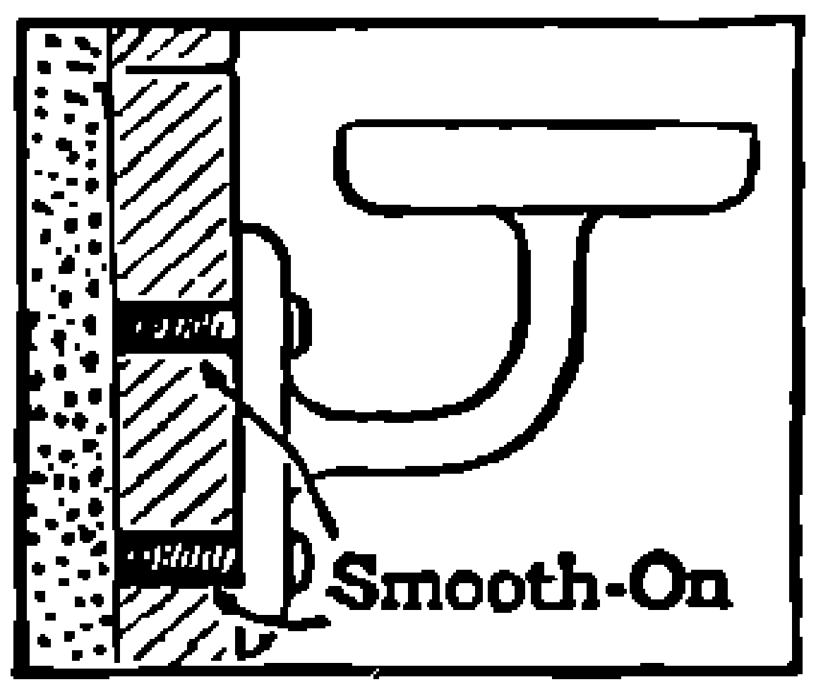

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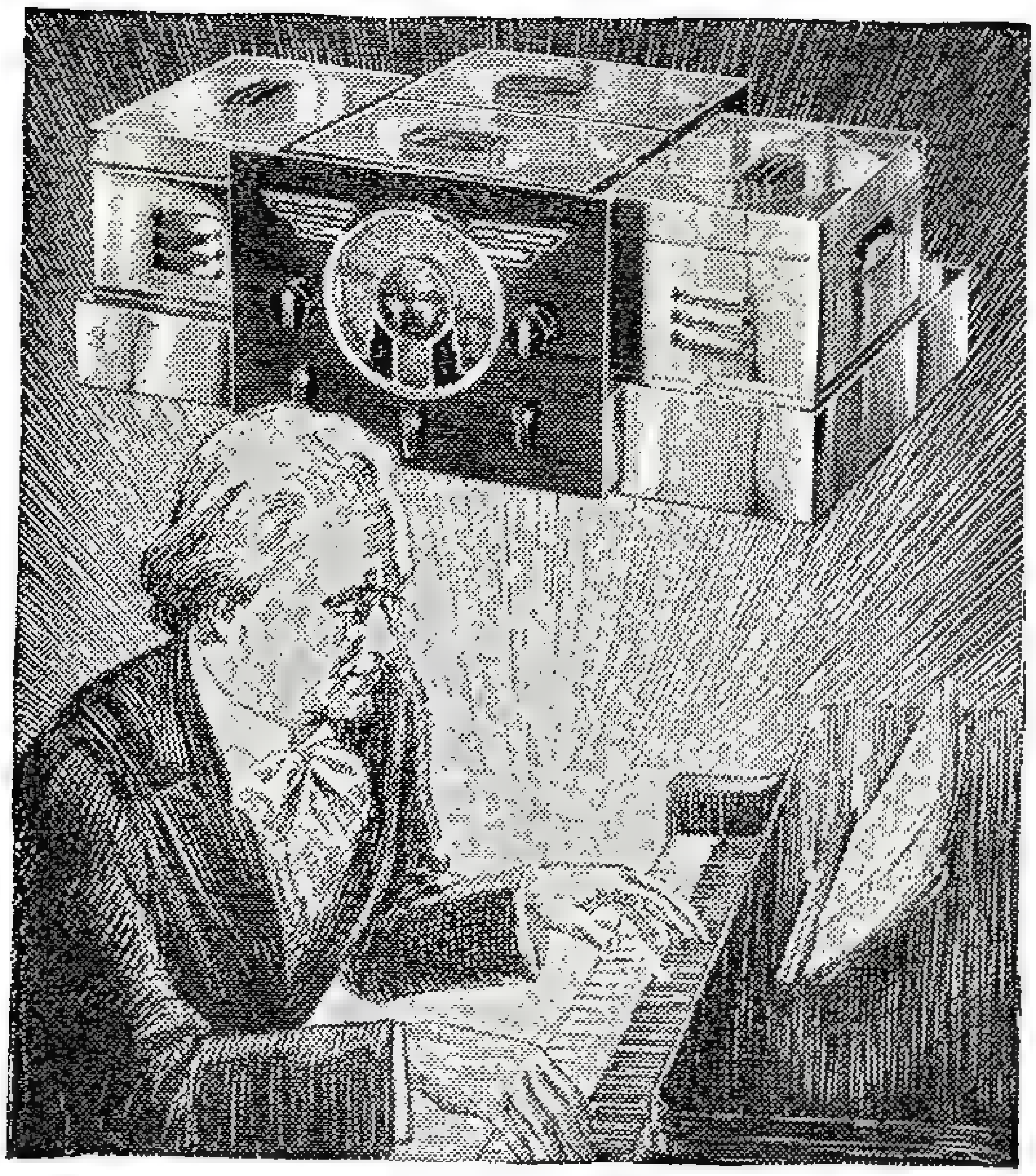

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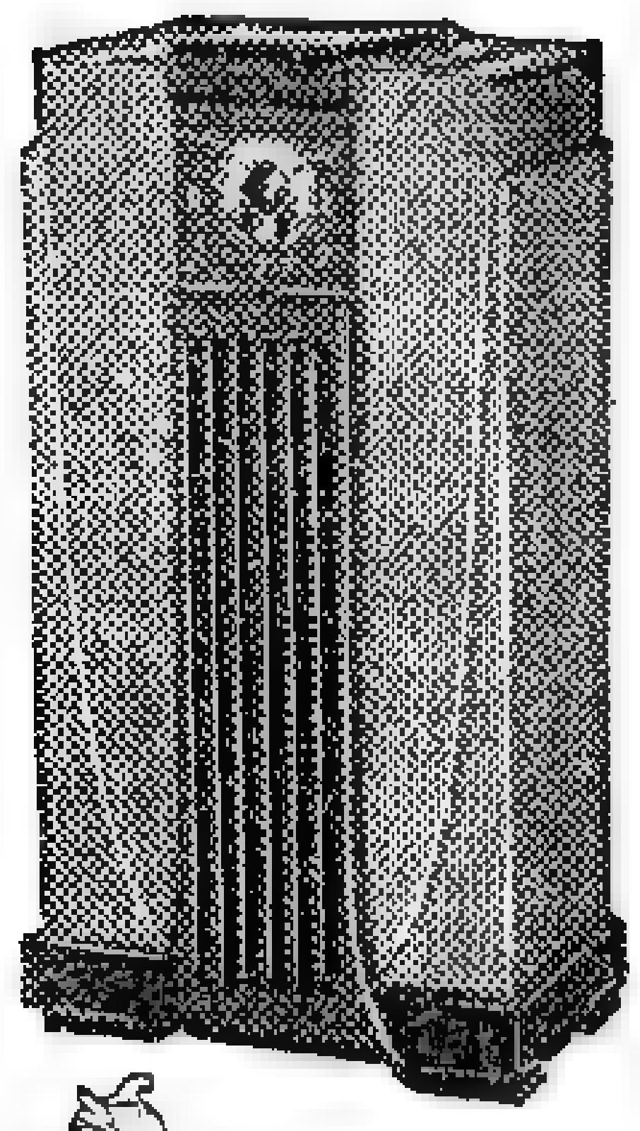

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Creating Figures for Wax Museums

[*Continued from page* 83]

mixing Plaster of Paris. "Like Washington, here. Fifty per cent of our business comes from orders for non-criminal characters.

Setting the head upright on a board, he took clay and worked it into slender, flat pieces. "These are 'stops,'" he said. "When plaster is placed over the head, these strips will break it up into panels."

Sun's Heat Cannot Melt Wax

"You can start heating the wax, now, Bill," he said, turning to his young assistant. "By the way—this is not ordinary wax. It's five different kinds of waxes, and it's tempered just like metal."

While the wax cools, he ties the three panels of the plaster cast together with heavy twine. Soon, the wax is gurgling into a spouted can. "Pour it slowly, we don't want any bubbles—"

As soon as the mould is brimful, Christophel immediately up-ends it back into the container. "We pour it out because we want a hollow head. If solid, it holds the heat too long and afterward expands out of shape. There's plenty now to give it about an inch of thickness all around."

The next step is to untie the ropes and remove the mould from around the wax casting. Chris next hauled out tools, then a handful of glass eyes—real ones—and false teeth!

"Just a few of the things that make them more real," said Christophel. "For each head a special set and size of teeth is used, copying, as near as possible, the persons' own. The eyes must match also. And—" he pulled down a huge box and opened it. Out of it cascades every known shade of hair. "Human hair! I even make eyebrows and eyelashes for my figures—to the exact length and size. The hair is stuck—imbedded—right into the scalp like this." He picked up a needle-pointed punch in one hand, a lock of hair in the other and began vigorously pecking away.

Body is Made of Paper, Not Wax

"Now about the body. My latest invention is a breathing figure. To start with, moulds are made of the body with plaster casts. But papier-mache instead of wax is used in construction," he nods toward Bill who is industriously slapping wet paper into the mould. "Only on exposed parts—heads, feet, hands, is wax used.

"Here is my breathing figure—" he walked over to a nearly complete body lying on a table. Reaching toward the chest, he pulled two door-like parts open. Inside was an off center wooden disk on a steel shaft. "When this disk turns, it lifts the divided pieces, causing the chest to rise and fall. Underneath is the silent electric motor running a reduction-gear timed to conform with breathing."

Clipping Dollars From Auto Costs

[*Continued from page* 65]

make an economy record. Mechanics loosened all the bearings, lubricated them with vaseline instead of grease, tuned the motor to its finest performance, and took the car to the level floor of a nearby valley. Here they drove for a number of miles, alternately gathering speed and coasting.

Low and High Speeds Eat Gas

When results were computed, the experimenters were amused and chagrined. The car had gone slightly more than 100 miles to the gallon! So fantastic were these figures that they did not dare use them in advertising, for no one would believe them.

These experiments prove beyond doubt that a careful person who knows how to drive for economy and has a well-adjusted car, can cut his gasoline bill astonishingly.

Speed is the motor's costliest attribute and at the same time offers the largest chance to save. If you drive 20 miles an hour, you will actually get twice as much mileage from your gasoline as at 60. The average automobile attains its best mileage per gallon of gas at a speed of from 20 to 25 miles an hour, then falls off rapidly in efficiency. The car that gives 17 miles to the gallon at ten miles an hour, will give 19 at twenty miles, 18 at thirty, 16 at forty, 12 at fifty, and only 7 at sixty.

Fast getaway is economy's next worst enemy. Recent experiments showed Bureau of Standards scientists that in some cars the carburetor could be adjusted to save at least 25% on gasoline, simply by sacrificing a little of the flashy performance of the car. Lightning stops eat fuel almost as fast.

Penalties of Faulty Driving

Actual measurement enabled engineers to work out a "price-list" of the penalties paid for some of the common faults in driving.

Excessive use of brakes, one mile per gallon.

Needless racing or "gunning" of the motor, two miles per gallon.

Unnecessary idling of the motor, one-half mile to the gallon.

Too heavy oil costs 1 to 2 miles per gallon.

A ten per cent up-grade costs 8 miles a gallon; a five per cent grade, 4 miles.

Driving into a 20 mile wind costs 3 miles to the gallon more than a 20 mile tail wind.

The driver at sea level gets 3 miles per gallon more than at 10,000 foot elevation.

The care you give your motor is a big factor in economy. Your new car is delivered to you in perfect condition, but like any other high-speed, precision piece of machinery, it needs occasional adjustments. For example, in an average engine which has gone one

[*Continued on page* 146]

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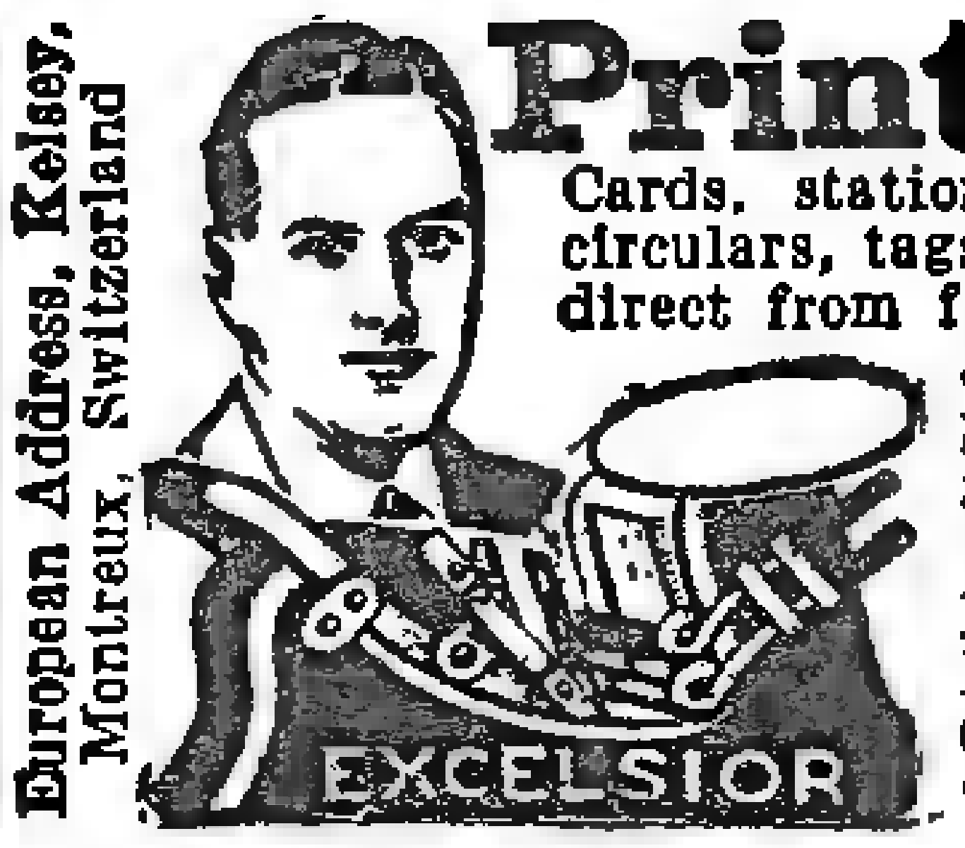

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Can You Identify Fish You Catch?

[*Continued from page* 76]

brook pickerel (*Esox vermiculatus*); and the banded pickerel (*Esox americanus*). Both the chain pickerel and the banded pickerel are found only east of the Alleghanies, while the western pickerel goes as far westward as Wisconsin, Iowa, and a portion of southeastern Minnesota, but was never numerous in Minnesota.

In the three true pickerel, there are no rows of yellowish or lightish spots up and down the sides as on the true and only great northern pike. On the three pickerel the background coloration is some shade of green with streaks, reticulations, or bars of darker against the green. The chain pickerel obtains its name from the fact that the markings on its sides resembles the chain armor worn by the knights of old.

Wall-Eyed Pike is a Perch

When a writer of some years ago gave the wall-eyed perch the name of wall-eyed "pike" he surely started something, and the argument will probably boom down through the ages. The wall-eyed pike is not a *pike* at all, but is the larger member of a group of perch led by the wall-eye, followed by a close relative, the sauger, and ending with the yellow, or banded, perch so common to our waters. Undoubtedly the first named was called "pike" by reason of its pike-like appearance.

If you are in doubt whether you have taken a wall-eyed pike or wall-eyed pike-perch, as it is sometimes called, rub your hand over the body. It will be found rough and harsh to the feel, as there is no slime covering its scales. The true pike or pickerel on the other hand have a body that is slippery with slime, the same being a film to protect the body against parasites. The extremely sharp points or spines in the dorsal (back) fin of the wall-eyed pike is another easy means to telling the fish. Yet if these two methods fail, look at the eyes of the fish. After the fish has been out of the water a short time they turn milky or whitish in color, sometimes as though white-frozen. One look at the eyes of the wall-eyed pike, and noting this white color of the eye-ball, instantly marks it as a wall-eye for no other fish has eyes that change in this manner. Also remember that whereas the pike, pickerel and muskellunge have only one back fin, the wall-eye has two.

The sauger (*Stizostedion canadense*) differs from the wall-eyed pike (*Stizostedion vitreum*) in that it is a slimmer fish than its relative, is lighter by far in coloration, and hardly ever goes over a few pounds in weight. Fishermen have a contempt for this fish and class it as "all bones and no fish." It is found

Can You Identify Fish You Catch?

in the rivers, and in many of the lakes of the north, principally in Canada. There is a disposition to drop *canadense* as a variety, and to class the wall-eyed pike and it as one. The difference between the two is not great.

While not as great confusion exists in differing between the large-mouth black bass and the small-mouth bass, it is sufficient to need some explaining.

In the small-mouth bass (*Mycropterus dolomieu*) the corner of the mouth is forward of a line drawn perpendicularly from the eye downward. In the large-mouth bass the corner of the mouth is back of this line.

In the small-mouth bass the eye has some touch of red to it, either yellowish red, orange red or some other such red shade. This is unfailing, no matter where you find the species.

No Stripe on Small-Mouth Bass

The background coloration of the large-mouth bass is greenish, varying according to the water it is taken from. The small-mouth bass is sometimes darkish green, but is mostly brown or brownish gray.

The green background coloration of the large-mouth bass is sometimes relieved by a black stripe or band that extends from the gill cover to the tail, in some specimens from some waters, very sharply and distinctly etched in, but in others, merely showing as a broken-up blotching of black along the lateral line on the side. This stripe is never found along the side of the small-mouth bass. Its markings, if any, are darkish perpendicular bars on the sides, absent in specimens from some sections of the country, but prominent in members of the species in other sections.

Spots Disappear on Lake Trout

The trout in this country with which the angler is most concerned are the lake trout, the brook trout, the rainbow trout and the brown trout. Of these the lake trout (*Cristivomer namaycush*) is most common, because it is taken and sold in the markets by the commercial fishermen. It is not a stream fish, being found chiefly in deep-water northern lakes, in several of the Great Lakes, throughout the region of Ontario, Montana and British Columbia. In the latter sections of the west it is also called mackinaw trout.

Young specimens of the lake trout are very much spotted in whitish against a grayish background. In older specimens of the lake trout the spots will have almost entirely disappeared, and the trout will be plain grayish and half silvery in color. Up to 12 or 15 pounds, lake trout keep their spots.

There are two varieties of the lake trout, namely, the plain gray trout and the so-called salmon-trout, or red-fleshed trout, often called erroneously, "land-locked salmon" in

[*Continued on page* 131]

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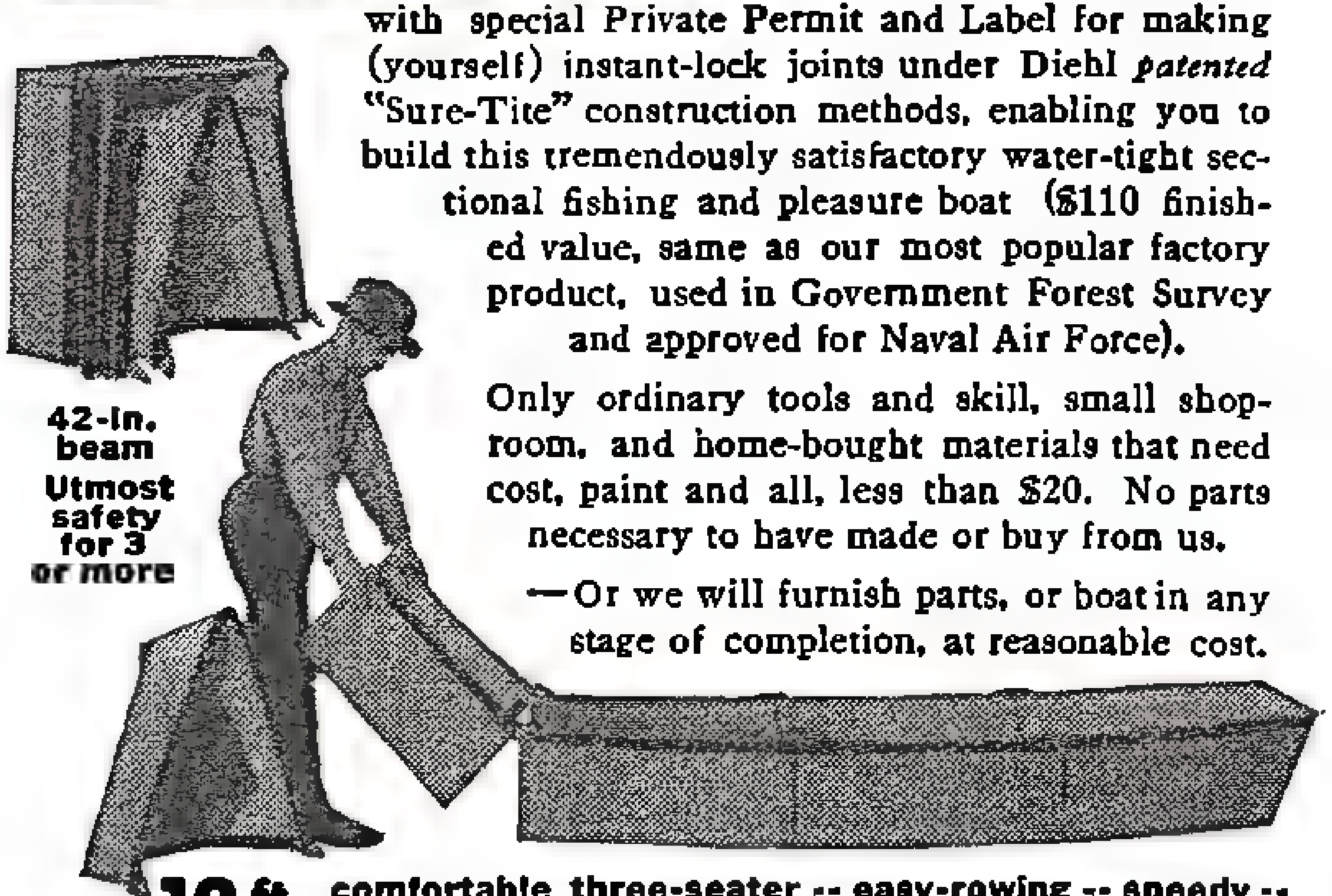
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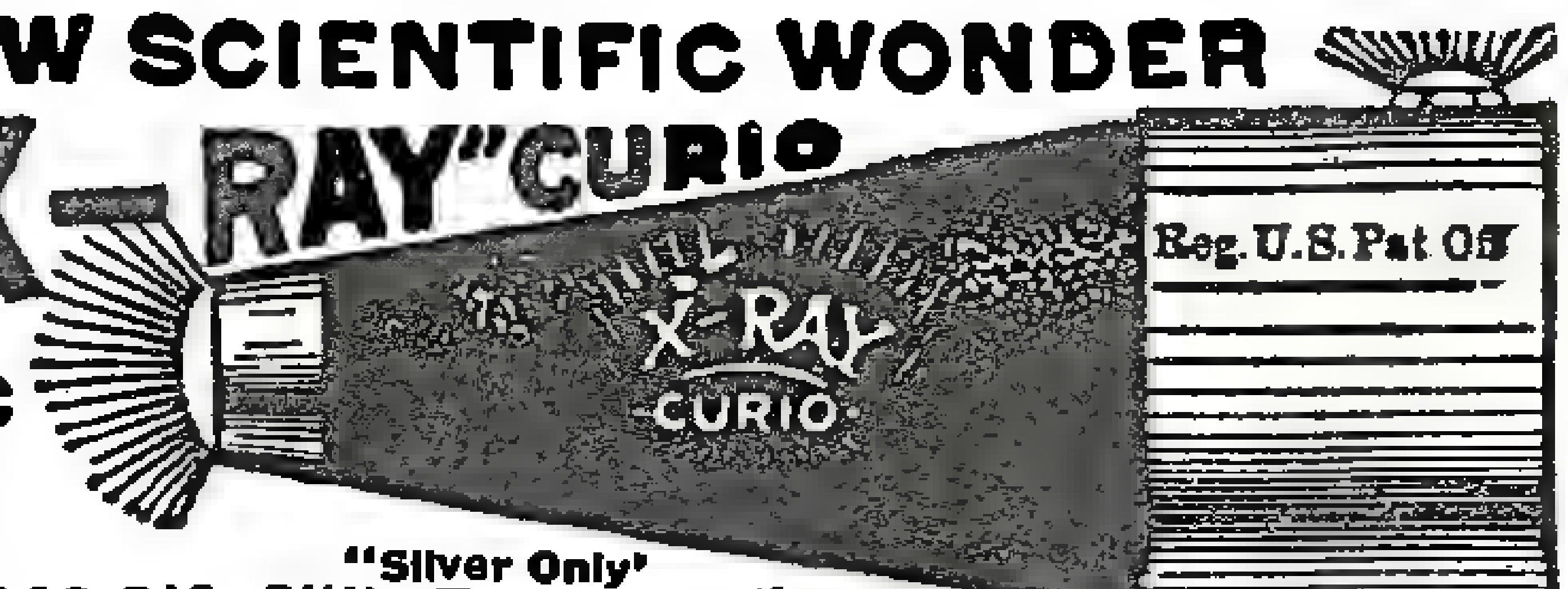

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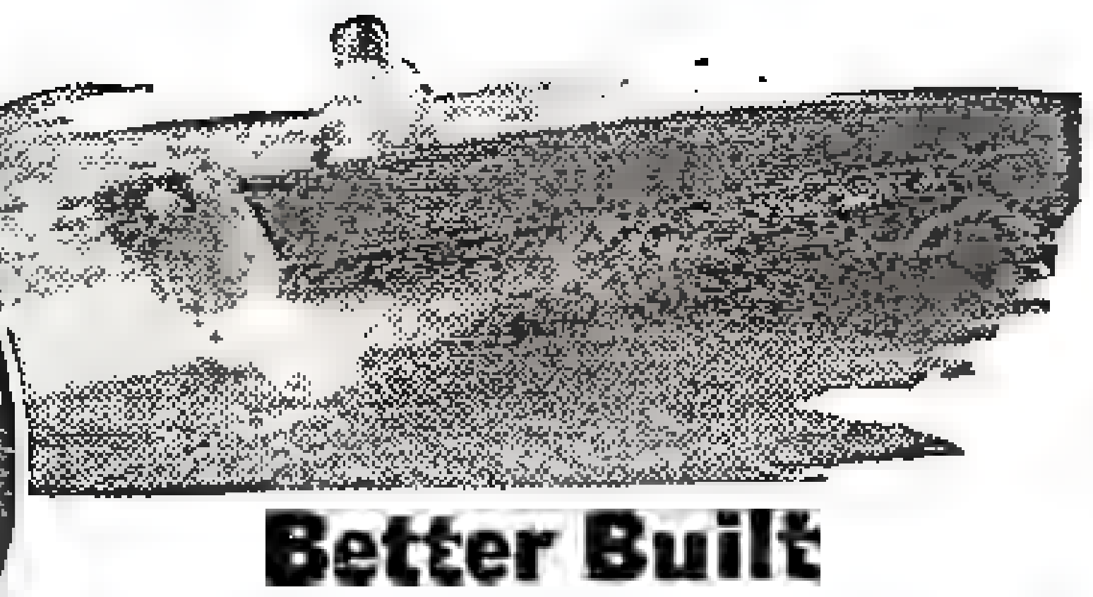

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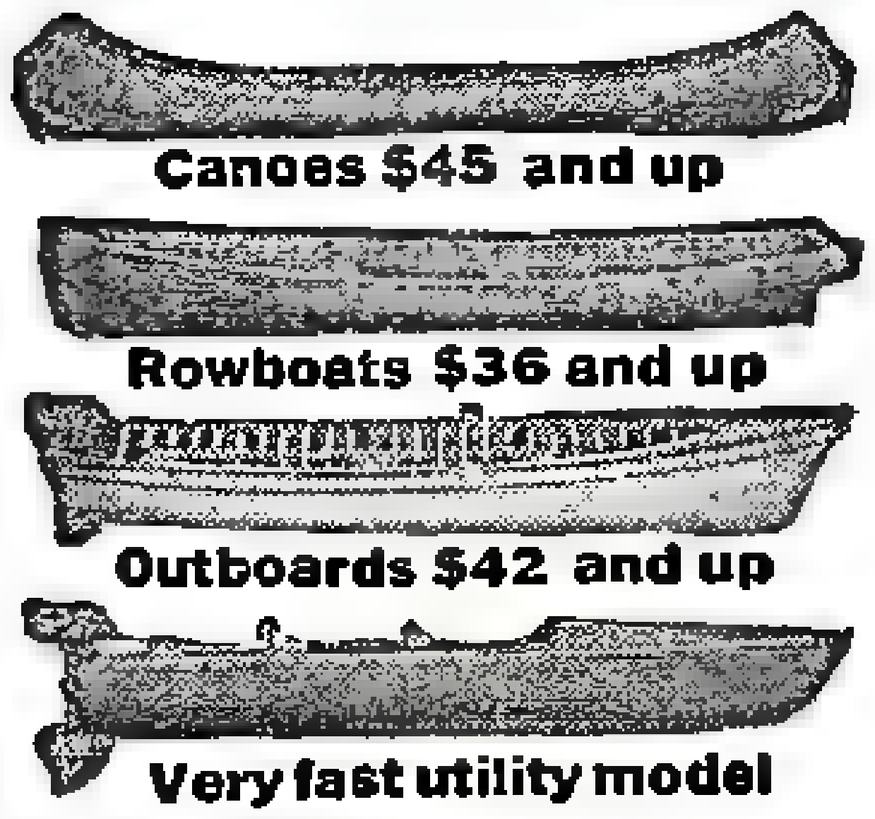

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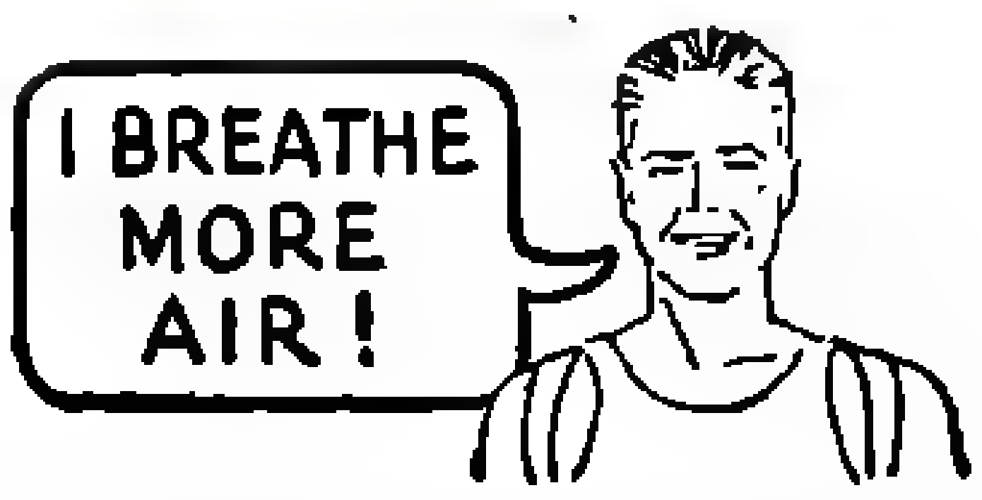
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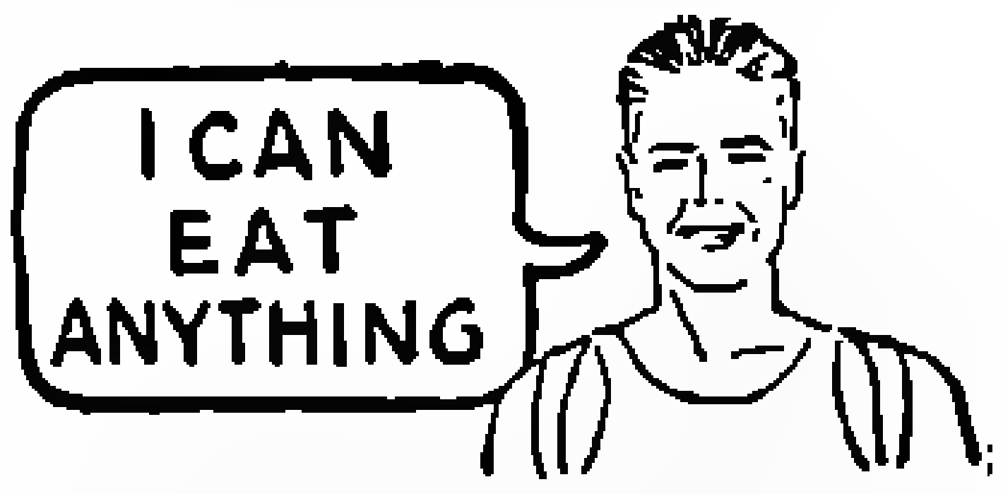

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"Midget Miller"—Model Racer

[*Continued from page* 95]

rod mounted on springs. The 2" holes in the frame give the axle just enough play for the average city pavements. If you plan to use the car on rougher roads, it is advisable to use wider stock for the frame and drill larger holes to give the axle and springs more play.

Next month construction of the "Midget Miller" will be completed. The article and drawings will go into detail on the handling of the springs, motor, shift, clutch, and construction of the body. Those who want to get under way immediately on this midget car should order the blueprints described below.

BLUEPRINTS FOR THE "MIDGET MILLER"

Blueline prints of the "Midget Miller", printed on tough paper to stand rough handling in the workshop, are available now at $3.00 postpaid. These prints contain both installments of the detailed instruction and plans, which are greatly enlarged. Send your orders to Modern Mechanix Publishing Co., 529 S. 7th Street, Minneapolis, Minn.

Science Builds the Modern Home

[*Continued from page* 70]

dehydrated air. It stays dry because nothing can get in to dampen it. This layer of air acts as an insulating balance between the panes. The temperature may go below zero outside, but the inside window panes stay more nearly the temperature of the room because the heat rays, blocked by the air space, do not escape so fast. This development is considered especially important to house-builders who like generous window space. It now appears that they can have it without putting too severe a strain on the heating.

Limestone, furnace slag, bottle glass and other materials are being blown into fibers which are matted into bats and used as snug insulating blankets inside the walls of the new house to prevent heat losses and keep out undesirable temperatures.

Whether one builds of lumber, brick, stone, concrete, steel or other things, science has been at work improving these materials for better houses. Lumber for instance, is now being made with micrometer-like exactness, corners rounded and smoothed to ease handling and ends accurately squared. More effective ways of treating lumber to curb termites and to make it more fire-resistant have also been developed.

Engineers and chemists have developed stronger brick and mortar, interesting forms of synthetic stone and just lately, pre-cast concrete joists have been placed on the market. They save building time and make the house more resistant to fire. These joists serve a double purpose. On the first floor, for instance they not only act as structural members but form decorative rafters for the recreation room in the basement. Paints with a rubber base for a more effective application to concrete have been developed. Concrete that looks like irregular-jointed stone, ashlar it's called, and concrete that resembles over-lapping clapboard for outside the house are other recent innovations.

New Plaster Board Eliminates Lath Marks

New plaster board, put on in relative small units with the aid of spring clips reduce noise transmission and break up strains or stresses so that the plaster is less likely to crack. It also eliminates lath and joist marks on the ceilings and wall. New forms of synthetic lumber made from wood fibers are on the market for interior trim and to increase noise absorption. There's a whole new "family" of synthetic resin plastics for interior and exterior walls.

New types of floor construction include cellular steel beams that also serve as electrical conduits, and metal clips for wooden floors without nails. There are new sound-absorbing plasters, an interesting new line of windows with spring and grooved balances instead of the usual weights. Copper piping, with sections joined together by soldered sleeves instead of the usual threaded joints and unit bathrooms than can be installed in a variety of room shapes and in various types of construction are other new ideas in plumbing. Copper sheeting, new cement and asbestos shingles are included in the 1935 model roofs.

Homes Being Built at Factories

The wider use of steel and glass as major building materials and the development of the more completely prefabricated house are interesting developments that will be watched with special care this year. Prefabrication, a method as old as the pyramids, is being worked out more completely in some of the new houses, particularly those of steel, plywood, glass and brick, to reduce assembly costs, save waste and to give standardized factory precision throughout the dwelling.

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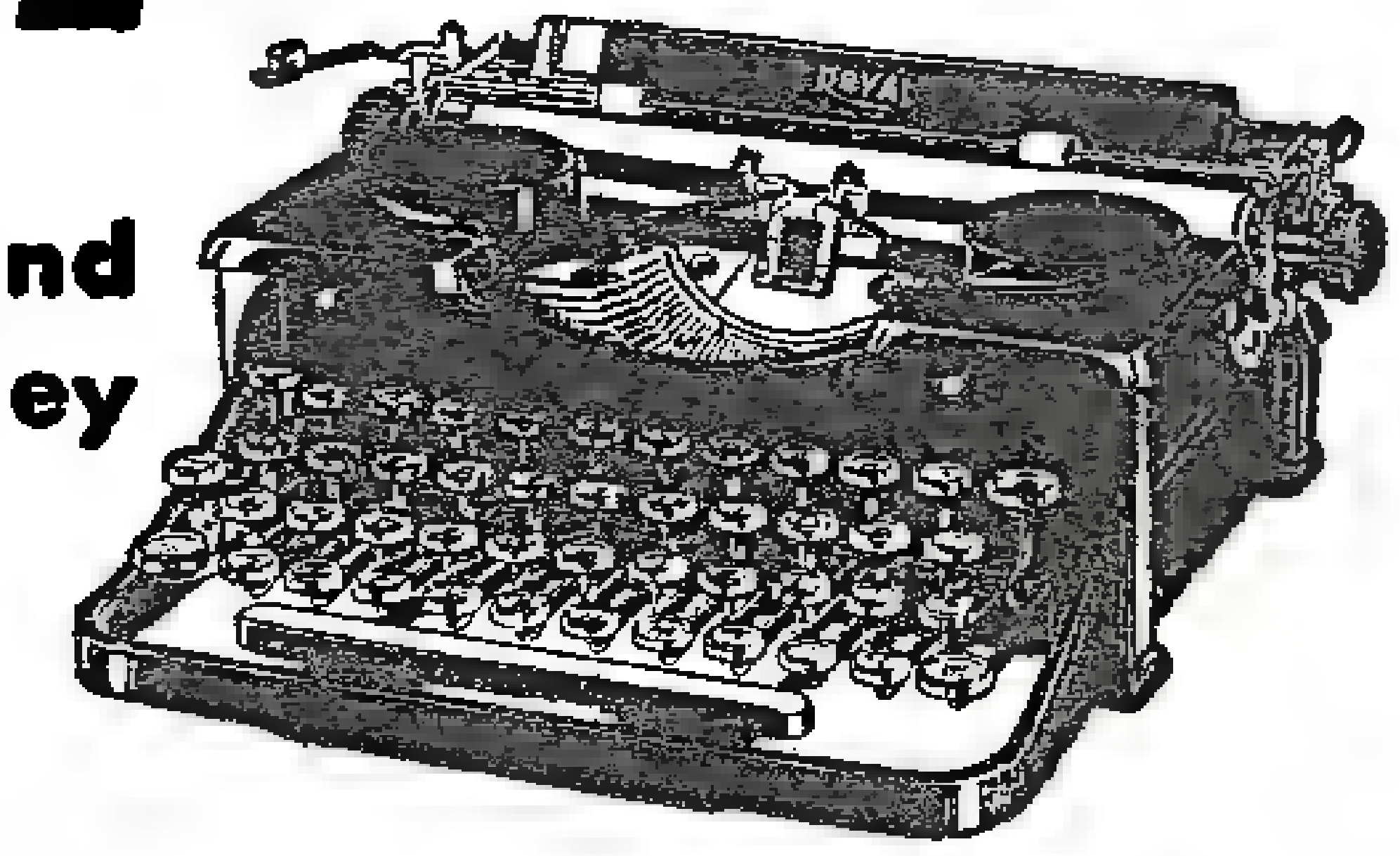

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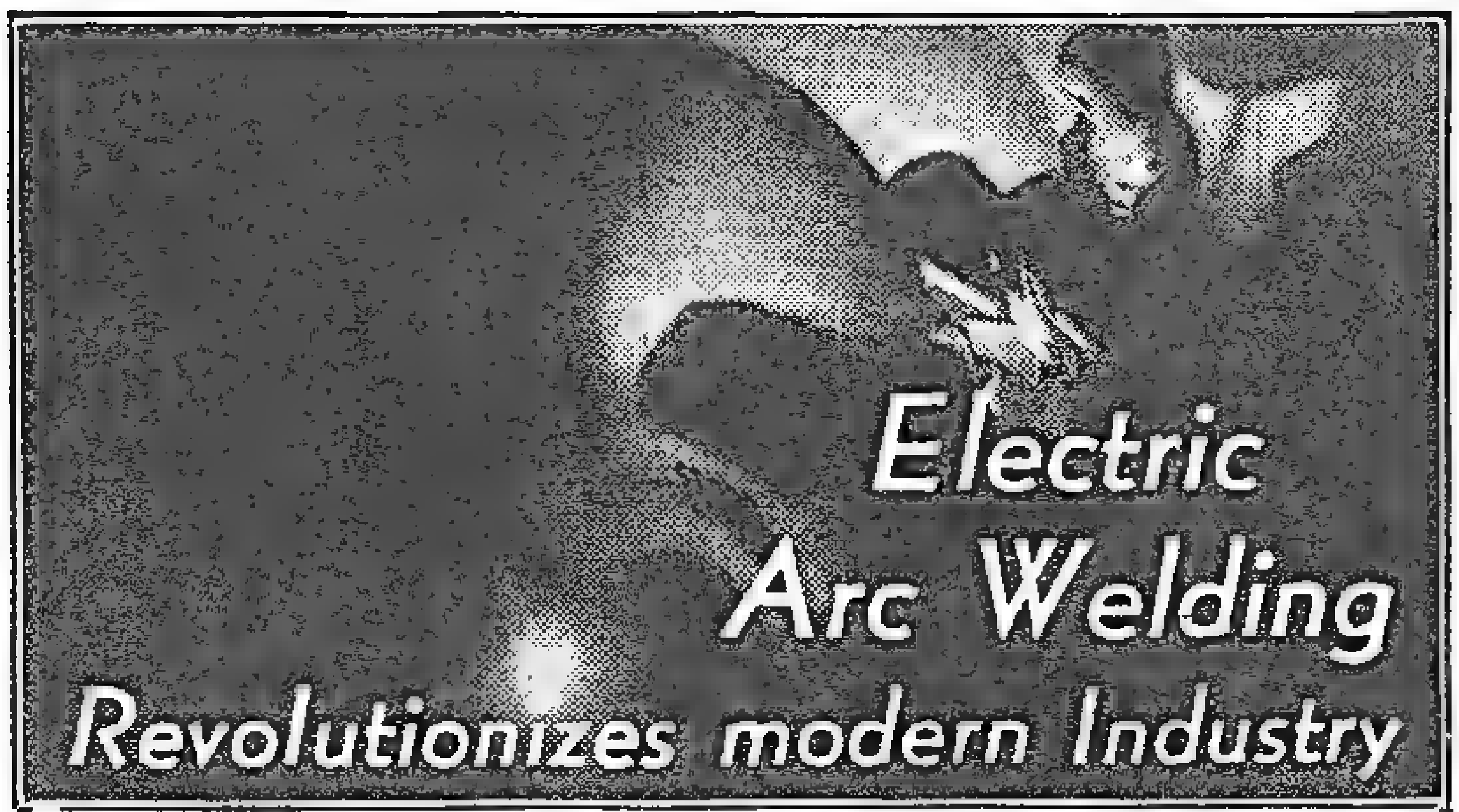

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3-Tube Toolbox Portable Radio

[*Continued from page* 92]

with a ¼-inch shaft extender couples the dial to the tuning condenser. This shaft and coupler may be made from an old bakelite dial. Break the dial and remove the bushing. Cut off a piece of ¼ inch shaft from an old control or condenser. Solder one end of this shaft into the bushing so that the set screw will be free to engage the condenser shaft. The chassis may then be removed without taking off the tuning dial.

Chassis Rests on Sponge Rubber

If an electralloy panel 7x18 inches long is used, there will be a three inch strip left over. This may be used to make two brackets which are bolted to the inside of the box about eight inches from the bottom, to support the chassis. A sponge rubber base is placed between the chassis and these supporting brackets. Two small pieces of sponge rubber will dampen tube vibrations if placed in the tops of the shield cans.

Bend down the two flanges that formerly held the tray in the box. Form the chassis from a strip of electralloy 7x15 inches long. This must be cut down to 6½ inches in width, and is easily done. Take a rule, mark off ½ inch and follow this line with a sharp pointed instrument until a deep cut results.

Place the panel in a vise and bend back and forth. It will break off cleanly where the line has been cut. Bend this panel to dimensions given and drill holes.

The battery cable fastens to a six prong wafer socket which is fastened on the bottom chassis flange. Rubber grommets or bakelite bushings of 5-16″ or ½″ size are used where wires pass through metal.

Filament Switch is a Tone Control Shaft

Use moisture proof hook-up wire and solder joints well, making resistors and condensers vibration proof. Wire in filament circuits first. The filament switch is on the shaft of the tone control.

The high impedance R. F. choke may be mounted on a stand-off insulator or soldered directly on the tube socket plate terminal. Study the connections to the six prong "19" tube carefully before wiring.

A means of cheap insurance against tube burn-outs is used in this set by wiring a flashlight bulb in series in the B lead. Any B battery short circuit will blow this bulb and not harm the tubes in the least. This fuse may save the cost of several sets of tubes. All B batteries may be disconnected by unscrewing the flashlight bulb.

Negative wiring and grounds are soldered to any machine bolts which protrude through

[*Continued on page* 132]

Grand Coulee's Electrical City

[*Continued from page* 59]

furnace. No chimneys are needed, giving an additional saving of $50 to the builder.

The electricity is being furnished to the contractors by the Washington Water Power Company of Spokane at a special rate which enables a five-room house to be heated for about $60 a year.

One reason for portable heaters besides their convenience, is that Mason City will exist only while the Grand Coulee dam is under construction, a period which may be from five to eight years. The builders will be able to salvage portable heaters more easily than any which are built into homes.

Electric Heat is Cheaper

The light circuits will have 110 volts, the heating, 220 volts. With the average five-room house requiring 16½ kilowatts of heat, it can be wired for heating at a cost of $2.00 per kilowatt. Heaters of proven quality may be purchased for about $5.00 per kilowatt which brings the net cost of the house, even if it must share in cost of distribution, to $181.50. The simplest hot air furnace at Mason City would cost $250 to which the cost of chimney would have to be added, or another $50. Figures compiled, but which cannot be revealed, show that electricity can be used in comparison with other fuels if the base rate does not exceed five mills per kilowatt If desired that a humidity unit be added, which is the ultimate goal, the cost of the heaters would be slightly higher, although the consumption would be less for the same result.

The Mason-Walsh-Atkinson-Kier company, or the MWAK as it is now known throughout the northwest, estimates that during the construction of the Grand Coulee dam a $100,000 saving will be made by heating with electricity.

Six Men Build Six Houses a Day

The homes and other buildings in this new city are of timber construction. They have siding of Pondosa pine; the floors are of native fir, with a sub floor and paper insulation. The interior furnishings are also of Pondosa pine. There is a front and a back porch on each. The houses and bunkhouses were cut and constructed in a lumber mill in Spokane and shipped, knocked down, to the dam site. There six man crews erected them at the rate of six houses a day.

Water for this mushroom city will be pumped from the swift-flowing and deep Columbia, chlorinated at the pumps, and settled by successive storage in each of three huge wooden reservoirs built high on the cliffs.

[*Continued on page* 130]

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Following the Migratory Birds

[*Continued from page* 77]

oceanic flyer, travels 2,000 miles over the Pacific between the Hawaiian Islands and Alaska.

While not as daring as golden plover and the turnstone, the arctic tern holds the championship for long distance flying—11,000 miles from his winter home in Patagonia to his summer home around the Taku glacier. This makes an annual flight along the coastline of about 22,000 miles, a low estimate when taking into consideration the fact that their breeding grounds are known to extend to within seven and one-half degrees of the north pole.

Aviators racing against birds have revealed many interesting facts about their speed. Small birds fly at an average of 20 to 37 miles per hour; crows, 31 to 45; geese, 42 to 55, ducks, 44 to 59; falcons, 40 to 48, and waders, 34 to 51.

The highest speed is set by a swift found in India which has been timed over a course at between 171.4 and 200 miles per hour. The homing pigeon, notorious for its speed, achieved 55 miles per hour in an accurately timed test.

The study of bird habits, their speed of flight, and their summer and winter haunts, is carried out almost entirely by men who trap and band the birds entirely without pay from the government.

The government supplies these men with numbered aluminum leg bands to be attached to captured birds. When a bird is banded, a record of the number is made, together with the date, locality, and species of bird concerned. When a banded bird is retaken, the number is checked to aid in the study of the bird's flight.

Grand Coulee's Electrical City

[*Continued from page* 129]

Power is brought in from Spokane over a 92 mile long, 110,000 volt transmission line. To carry this line across the deep gorge of the Columbia river required the stringing of a cable span 3,087 feet long, the longest power line span of its kind in the world.

A sub-station within the new city reduces the 110,000 volt power to 110 volts for the lighting circuits, and 220 volts for heating.

Twelve homes are set aside as a test laboratory for the College of Mechanical Arts and Engineering of Washington State College. In each of these houses meters and instruments in special rooms on the back porches will record the power requirements of heating and other electrical equipment, and at the same time record indoor and outdoor temperatures, humidity, and barometric pressure.

Can You Identify Fish You Catch?

[*Continued from page* 125]

the north. If you take a deep-run lake trout and its flesh is pink or reddish, much on the order of the salmon, be certain that you have taken a red-fleshed lake trout. If the trout has ordinary white flesh, it is the gray trout.

Brook Trout Have Tiny Scales

Our most famous and much extolled brook trout (*Salvelinus fontinalis*) is easily told by several coloration characteristics or markings that are known to it alone. If the trout you take has the familiar wormtrack reticulations or vermiculations on its back and likewise on its dorsal fin, a feature that is possessed by none of the other trout, be certain that you have taken a brook trout (*fontinalis*).

Also, if the scales are so small that you can scarcely see them with the naked eye, this is another brook trout characteristic, and identifies the fish. Other trout have noticeable scales, easily seen at a glance. The brook trout also has red spots on its sides, delicately circled with blue.

The brown trout (*Salmo fario*) was not native to this country, but was introduced from Europe. It has none of the wormtrack markings on its back and dorsal fin, but has some red spots on its sides much like that of the brook trout, but larger.

The rainbow trout (*Salmo irideus*) has none of the red spots on its sides, therefore will not be mistaken for either the brown trout or the brook trout. Its body is sprinkled with black spots in greater or lesser number. Its chief distinguishing mark from the other two trout is a reddish or purplish-red band from its gill cover along its side to its tail.

Rock Bass Have Red Eyes

What is a calico bass? This is a question that all too often comes up. The calico bass, or black croppie, is the northern representative of the croppie species. The southern member is the common or white croppie which has been introduced into the north as the result of which it is now found over most of the range covered by the calico bass.

The calico bass (*Pomoxis sparoides*) is sometimes almost black in color, so heavy are the blotchings of dark on its sides. The common or white croppie is but little marked, and is, sometimes, almost silvery.

If you take a fish that has the shape of the sunfish, and very much the same in size, on the average, but which has red eyes, then be assured that you have taken the so-called "red-eye" or rock bass (*Ambloplites rupestris*), common to much of the eastern part of the country, and found in the south as well as the north. The rock bass has a yellowish-brown coloration, somewhat mottled.

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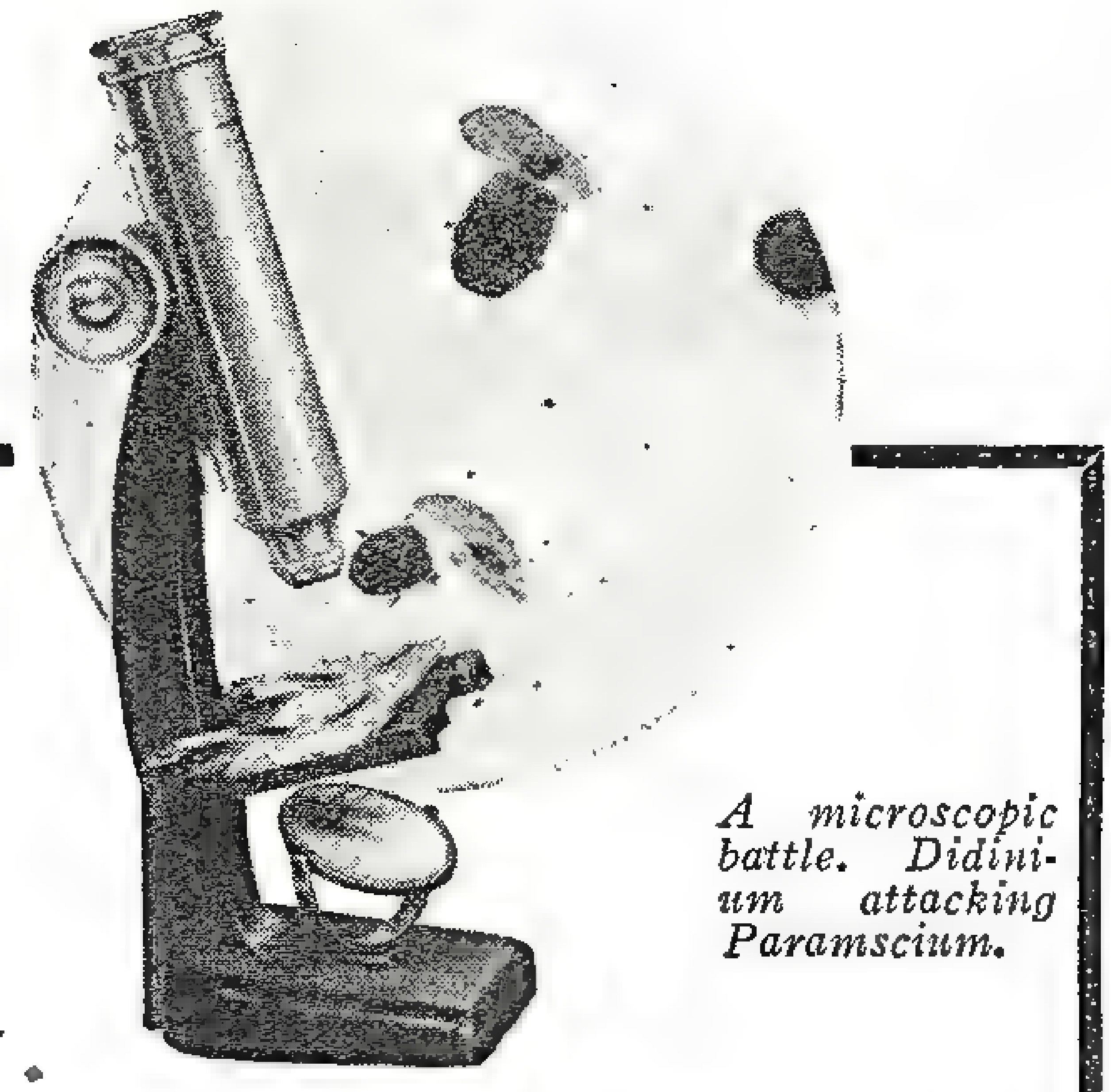

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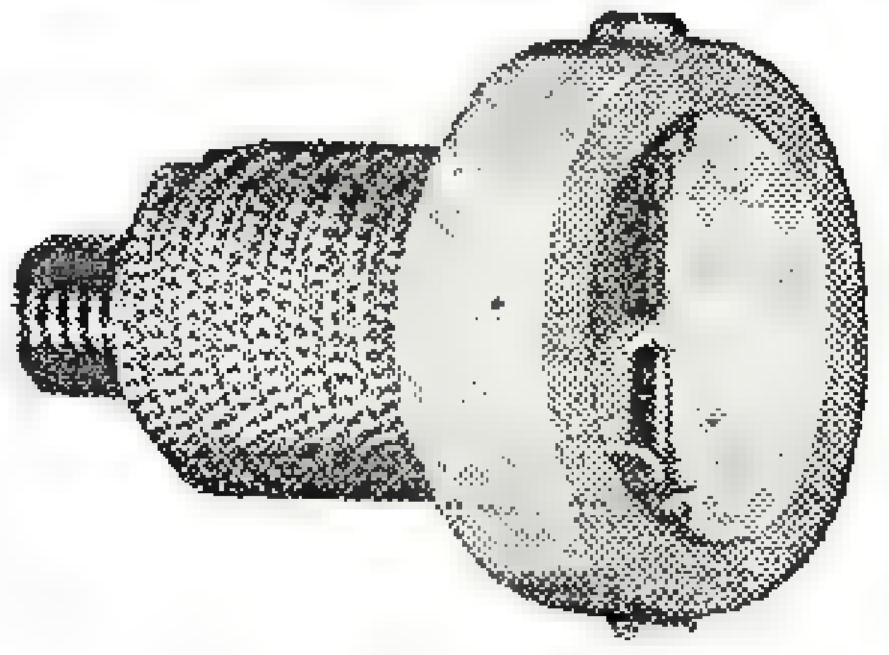

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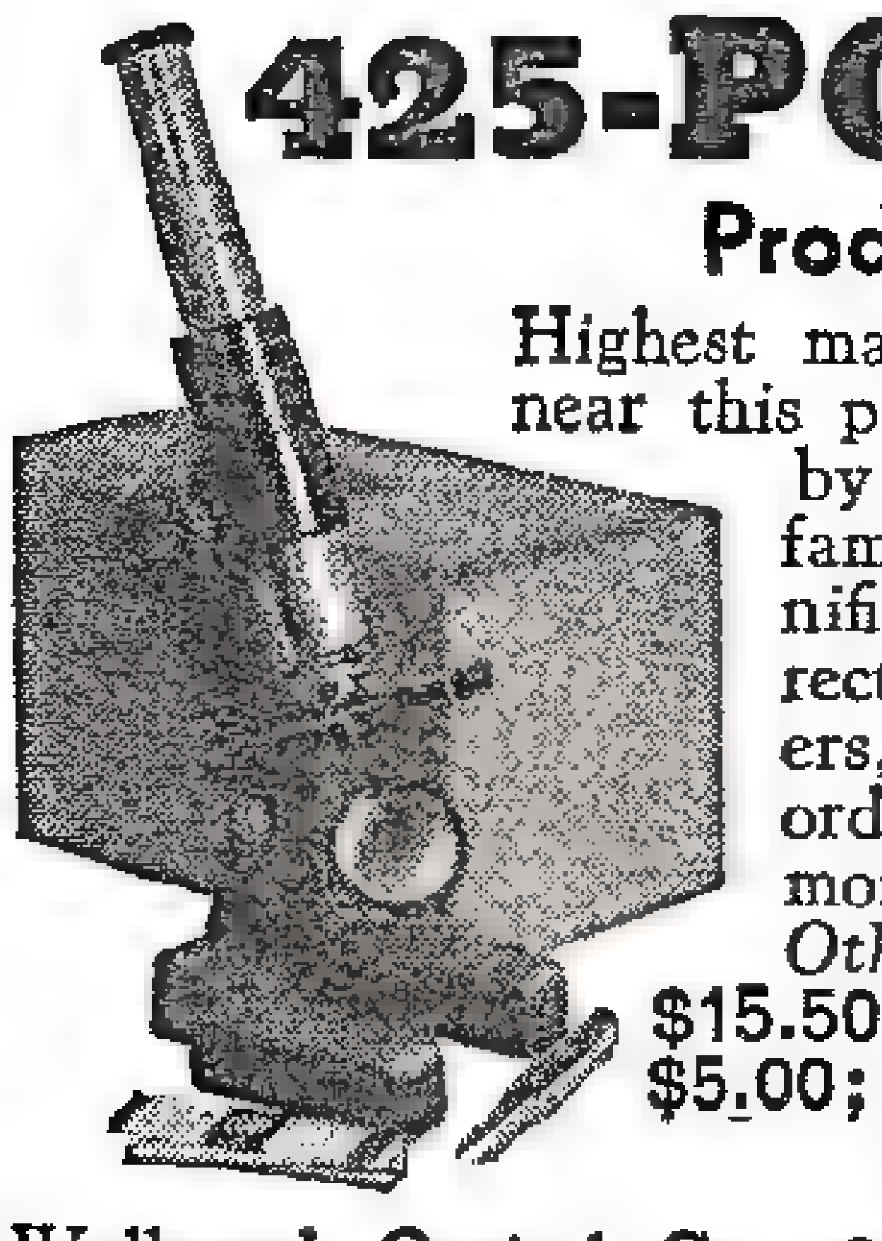

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How to Stain Your Microscope Slides

[*Continued from page* 61]

neutralize any remaining acid. The above method is known as *regressive staining,* since the color can be removed.

Now pass the fabric into a clearing solution such as aniline oil or carbon xylol for twenty minutes, then into pure xylol for ten minutes. The specimen is now ready for mounting in balsam on a slide.

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Turpentine may be used instead of xylol as a clearer just before mounting.

3-Tube Toolbox Portable Radio

[*Continued from page* 128]

the underside of the chassis; these are all bonded together by soldering a bus wire to them. This gives a well defined path for return of R. F. currents.

The coil form is a 6 prong low loss type made for short wave work. It fits into a six prong Isolantite socket, from which connections are made to a four contact selector switch mounted on the front panel. The grid winding is tapped in four places to allow selection of four different bands. These taps are brought to four prongs on the coil form. Though the grid winding is continuous, it is in effect broken when the grounded switch arm contacts the different taps and shorts unused coil portions to ground.

The two remaining coil prongs are for the tickler winding; this is in one winding but distributed with different turns for different coil sections. Grid coil windings are spaced five-sixteenths of an inch apart. Tickler windings must be wound and spaced between by these experiment. If oscillation cannot be obtained over a part of a certain band, push grid and tickler coils for that band closer together.

The coil may be removed and windings changed without disturbing parts or wiring.

BLUEPRINTS for this three-tube toolbox portable receiver, showing clearly every detail of the sketches on these pages, are available to radio experimenters at 50 cents postpaid. These blue-line prints, on tough white paper, contain in addition a complete detailed list of the parts needed to build the set. Modern Mechanix Pub. Co., 529 S. 7th, Minneapolis, Minn.

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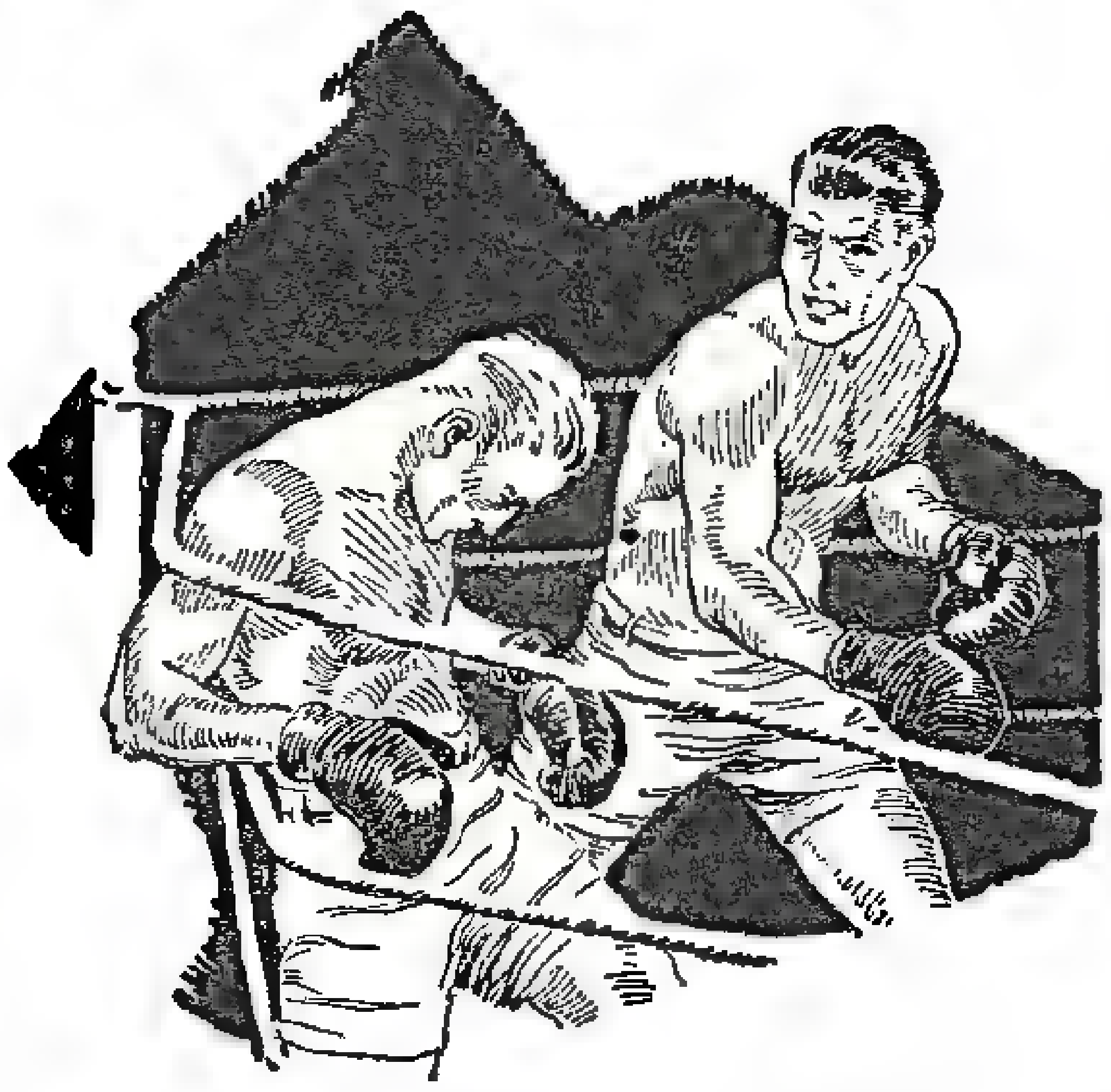

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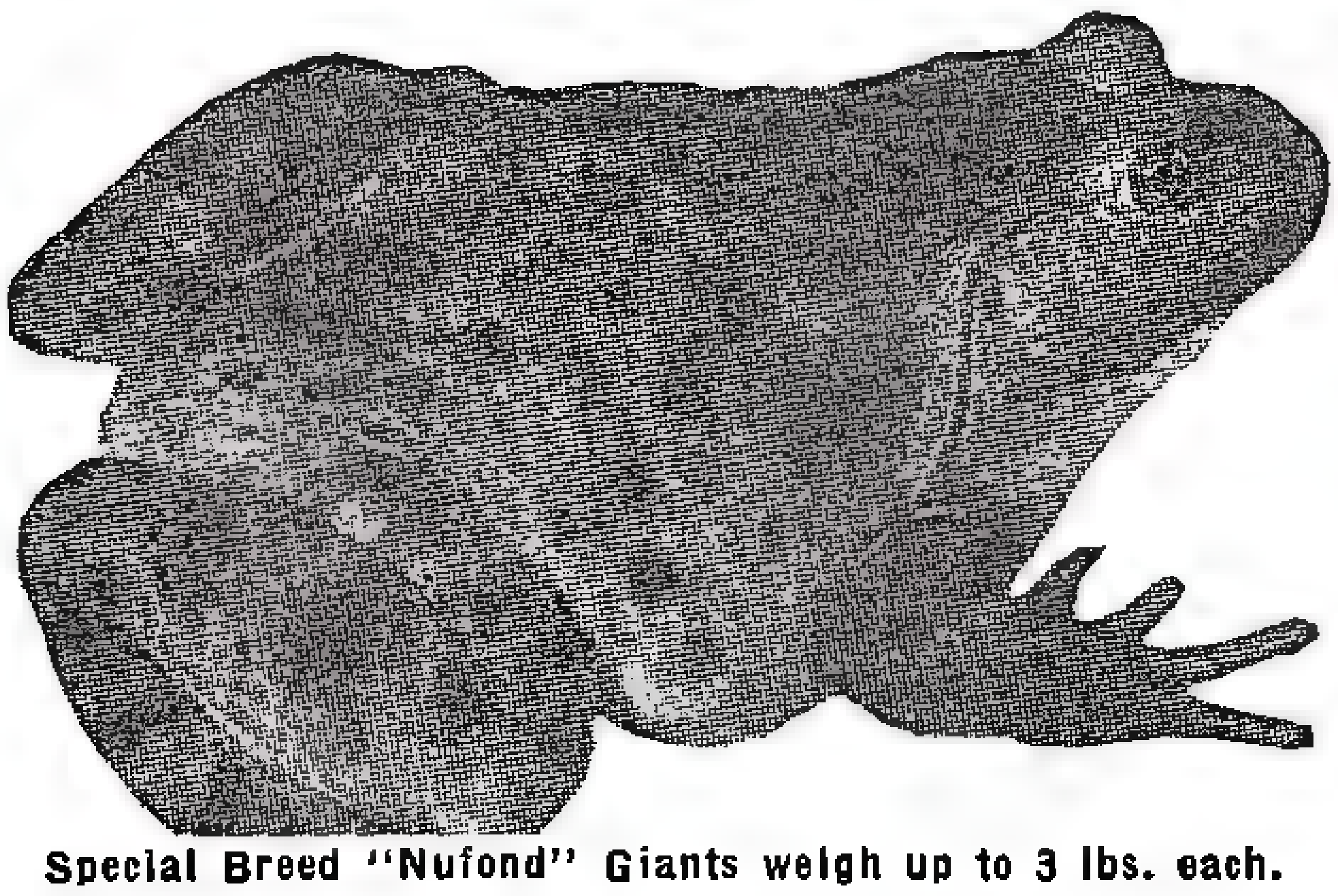

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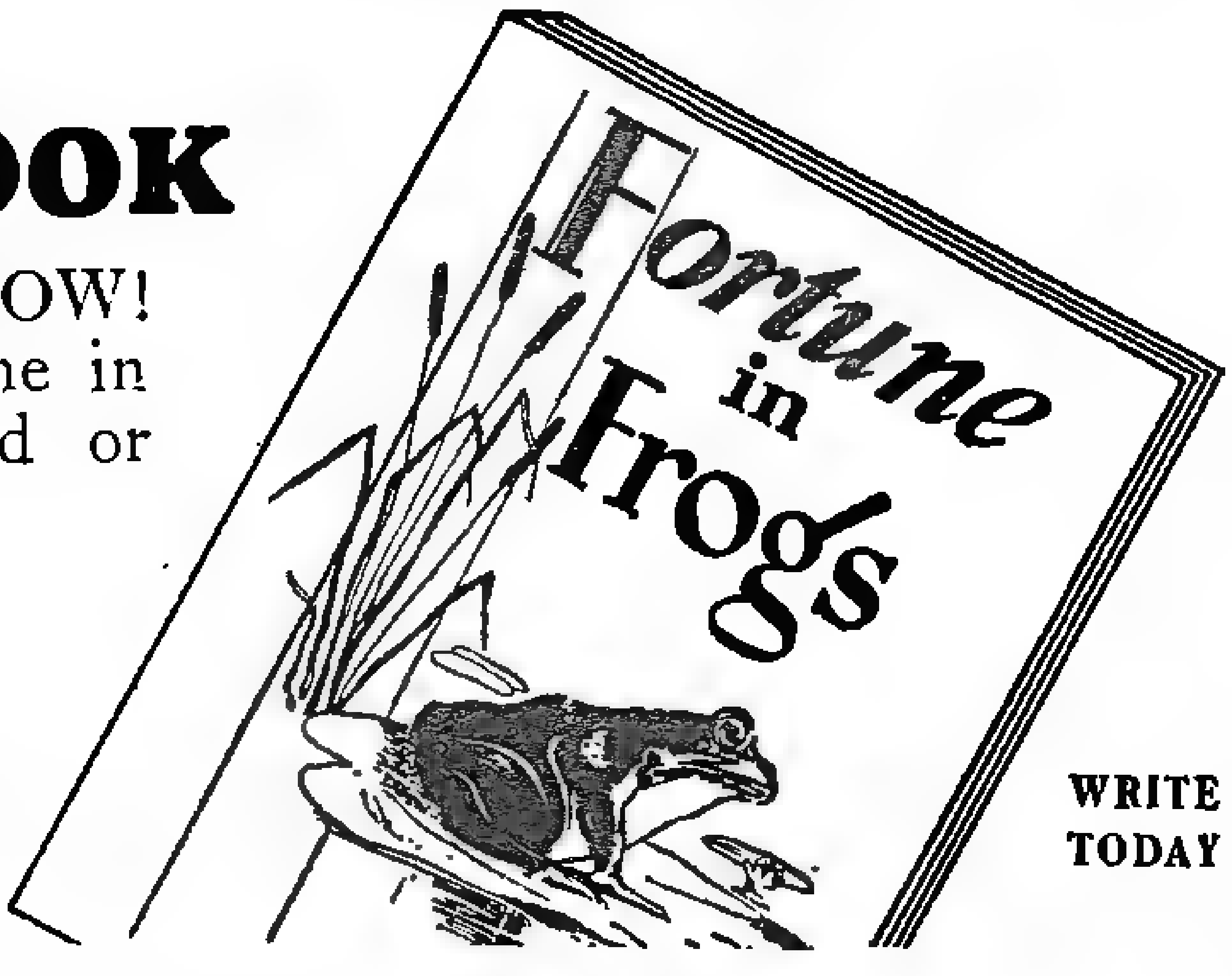

WRITE TODAY

Classified Advertisements

Rate for classified ads, 15c per word (include name, address and all numbers) per insertion. (New rate effective with April, 1935, issue.) Minimum 10 words. Cash must accompany order and be received in this office March 3 for the May issue (on sale April 30). Address Classified Mgr., Modern Mechanix and Inventions, 1501 Broadway, New York City.

A. C. GENERATOR

TWENTY new practical changes for automobile generators. See our advertisement at bottom of page 29. Auto Power, Inc.

DODGE 500-W self-excited A. C. generators $25. Chas. R. Hoge, 5348 Cornelia Ave., Chicago, Ill.

ACQUIRABLE INFORMATION

WHERE to Buy Anything—Manufactured, Wholesaled. 25c coin. (NAME-IT). King, 3223 Sixth Street, Harrisburg, Penna.

ADDING MACHINES

NEW $4.75 Automatic adding machine. Fully guaranteed. Bassett, 1458L Hollywood Avenue, Chicago.

ADVERTISING AGENCIES

ADVERTISE: $15 reaches 6,000,000 readers with 24 word ad. Newspaper and mail-order magazine. Rate-Guide, free. Chicago Advertising Agency, 22 West Jackson, Chicago.

ONE INCH Display 3 months, 40 magazines, $3.00. Halspence Exchange-M, 509 Fifth Ave., New York City.

ADVERTISE—24 words in 250 newspapers $10. Lists Free. Advertising Service Bureau, 4650 Drexel, Chicago.

24 WORDS in 50 newspapers, $2.00. Goodall Agency, Box 1592, San Francisco.

FREE NEW advertisers rate guide. Brown Advertising Agency, 140 South Dearborn, Chicago.

AGENTS WANTED

NEW marvelous electric light bulb gives strong, concentrated white light. Consumes 36% less current. Stores, factories, institutions buy quantities on sight. Big profits. Exclusive opportunity for right party. M. Masterlite Co., 110 East 23rd, New York.

FREE Circulars describing thousands of money making plans. How you can make thousands of dollars yearly in a Mail Order Business, starting with a few dollars at home in spare time. Write to Mail Order Institute, 669-L Marcy Ave., Brooklyn, N. Y.

BIG MONEY and Fast Sales. Every owner buys Gold Initials for his auto. You charge $1.50; make $1.45. Ten orders daily easy. Write for particulars and free sample. American Monogram Company, Dept. 11, East Orange, New Jersey.

AGENTS: Smash go prices. Santos Coffee 12c lb. 4-oz. Vanilla 8½c. $1.00 size Tonic 14c. Razor Blades 10 for 8½c. 100 sticks Chewing Gum 12c. 150 other bargains. Experience unnecessary. Write Carnation Co., MN, St. Louis, Missouri.

MAKE MORE MONEY Taking Orders Shirts, Ties, Underwear, Dresses, Hosiery, Raincoats, Coveralls, Pants, Uniforms. Outfit Free! Nimrod Company, Department 132, 4922-28 Lincoln Avenue, Chicago.

START bargain store business. Tremendous profits. New and used clothing. Bankrupt and auction sale merchandise. Experience unnecessary. Everything supplied. Publix, 568-HE Roosevelt, Chicago.

SELL New and Used Clothing 100%-300% profit! Satisfaction guaranteed. Experience unnecessary. We start you. Catalog free. Liquidation Merchandise Company, AK-550 East 43rd, Chicago.

SELL Colored Folks: Hair Straightener, Bleach Cream, Perfumes, Incense, 300 Products. Write for Free Samples. Big Money Making Offer. Valmor, 5249-SM Cottage Grove, Chicago.

BUILD Big Business—Making chipped glass name plates, numbers, signs. Resilvering mirrors, metal plating. Illustrated booklet free. E. Palmer, 517, Wooster, Ohio.

PENNY Each. Popular Sizes. Guaranteed Window Sign Letters. Enormous Profits. Easily Applied. Free Samples. Atlas Sign Works, 7941-G, Halsted, Chicago.

AGENTS clean up. Automatic cream siphon delights housewives. Particulars free. 20c coin brings sample. ASCO, Box 349-M, Frankfort, Ohio.

GOOD Income Plating Auto Parts, Reflectors, Mirrors, by new method. Outfits furnished; free particulars. Gunmetal Co., Ave. A, Decatur, Ill.

$$ LUMINOUS PAINT!! Makes Anything Shine in Dark!! Easily made! "Formula"—$1.00. T-S-G-Publ., Box Ten-M, Wilkinsburg, Pa.

$75,000,000 Market for Firefuse Automatic Fire Alarm. Rings doorbell at 145 degrees. Sells dollar. Sample 35c. Goldenrule, Kalamazoo, Michigan.

BIG MONEY applying gold initials on automobiles. Easiest thing today. No experience needed. Free samples. "Ralco," 1084 Washington, Boston, Mass.

AMAZING, Healthful, Energizing. Hu-Tran-Aton plays radio through body, agent's sample $1.55. Hu-Tran-Aton Co., 20 W. 22nd St., N. Y.

CASH Income Daily Resilvering Mirrors; Replating Metalware; Making Glass Signs. Portable Outfit. Sprinkle, Plater, 850, Marion, Indiana.

REGULAR income, home, office, no canvassing, prospectus free. Niel's Specialty Sales, Box 6, East Rockaway, New York.

AGENTS' Gold Sign Letters for store windows. 500% profit. Free sample. Metallic Letter Co., 426 N. Clark, Chicago.

AGENTS! Sell your own products! Bigger profits. Free literature describes all. Barrett's, 4243 Keystone, Chicago.

MANUFACTURE your own products. Free information. Guisinger, 1626 Que St., Lincoln, Nebr.

FREE Literature describing many money making plans. D-Belfort, 4042 N. Keeler, Chicago.

REGULAR income; home, office. No canvassing. McArthur Co., Desk 19, Butte, Montana.

1000 BUSINESS CARDS cost $1.17. Sell $1.75. Brigshaw, 3214 Huron, Chicago.

AIRPLANES

BUILD 3-Cylinder aircooled Sportplane Motor. Half-size blueprints, $1. Parts Cheap. Allison Airplane Co., Lawrence, Kansas.

ARTISTS

ARTISTS—Money for You. Complete information 10c. Straley, 13½M, Main, Springfield, Ohio.

AUTOMOBILES

RACING NEWS from all American tracks—52 weekly issues $2.00, outside U.S. $2.50 (published since 1921). National Auto Racing News, Box 11, Norwood, Ohio.

AUTOMOTIVE SERVICE EQUIPMENT

MICROMETER Reads outside every thousandths between 1½, 5 inches $1.00. Pick-up tool reaches inaccessible parts. Starts bolts, etc. 30c. Agents Schaap, Springfield Gardens, Long Island.

AVIATION

ARMY Air Corps gives free flying training, salary, expenses paid. Information pamphlet, how to apply, 20c. Same information on Navy Aviation training, 20c. Information pamphlet, Marine Corps Aviation, 20c. All three, 40c. Used Airplanes $40 and up. Literature 10c. Continental Sales, Box 344A, Indianapolis, Ind.

METAL tipped propellers; Fords, $9.98; Henderson, $8.50; Harley, untipped, $3.50; New Production Ships, $98.00; Improved LeRhone 40 H.P. motors, $127.00. Photos, information, and leather bound flying manual, 25c. Hibbs, Dept. 2, Ft. Worth, Texas.

GET into Aviation. Air transport pilots get up to $7,000 per year; mechanics, $2,500. Learn at this government approved school. Write for complete information. State age. Lincoln Flying School, 4001 Aircraft Building, Lincoln, Nebr.

AIRMINDED young men interested in entering aviation as apprentices. Write immediately, enclosing stamp. Mechanic's Universal Aviation Service, A-13291 Ardmore, Detroit, Mich.

LORENZEN Propellers for Airplanes, Ice, and Snowsleds, and Wind Driven generators. Large illustrated catalog, dime. Lorenzen Propeller Company, Niles, Michigan.

HERE'S HOW! Complete, illustrated flying instructions, written by engineer-pilot; will save you many times their cost. Send $1 to Sinclaircraft, Box 182, Seattle, Wn.

AVIATION Opportunity. Learn aviation mechanics at home by new method. For information send 25c. American Technical Institute, Box 59, Des Moines, Iowa.

LeRONE Motor, 80 h. p., propeller, spare parts, unused. $90, car or motorcycle. L. Brindley, 16 Langdon, Madison, Wis.

BATTERIES

PROFIT rebuilding batteries. Make your own plates. Information 25c (coin). Wind driver charger plans 25c. Gen. Batt. Service, 78F Glenwood, Minneapolis, Minn.

BIG MAILS

AMAZINGLY big mails—newest opportunities whole year, 25c. International Agency, M-4, Cincinnati.

BIG Mails, Magazines, catalogs, propositions, etc. Send 10 cents. Anderson Press, Box 3178, Miami, Fla.

BUSHELS of letters daily bringing money-making opportunities! 25c. Mailmarts, M-4, Cincinnati.

100 BIG Mails during 1935, 25c. Midwest, 4854 Reading, Cincinnati.

BLUEPRINTS

AUTO RADIO blueprints, with plans for 6 tube set and vibrator type B battery eliminator, sent postpaid for 50c. Other radio blueprint bargains listed in new M-M blueprint book, sent free for stamped, addressed envelope. Modern Mechanix Publ. Co., 529 So. 7th St., Minneapolis, Minn.

SPEED-E-ARC Electric Welder. 75 ampere. Built from automobile generator. Complete instructions and proven blueprints $2.00. C. M. Carlson, 2212 Grand Ave., Omaha, Nebr.

BOATS

LATEST Boat Sensation! New 20-lb. Mead Sportsman's Ki-Yak assembled at home easily, quickly from complete factory-cut kit. $6 Paddle now given with yours—if you hurry! Rush dime for Catalog. Mead Gliders, Dept. MC-4, Chicago.

CUT-TO-FIT Kayaks, Canoes, $6.95 up, complete. Catalog for dime, instructions for quarter, refunded with order. Boat Shop, 737M, Greenville, Pa.

BOOKS

SEND stamped, addressed envelope for free copy of big M-M Blueprint book, listing many workshop books and blueprint plans. Modern Mechanix Publ. Co., 529 So. 7th St., Minneapolis, Minn.

MULTIPLY or Divide any sized numbers easily with The Math Pony. Dictionary of Numbers. For Business, School, Home. 90,000 Products. 212 Pages. $1. Box 1810-N, Milwaukee.

BOOKS AND PERIODICALS

BOOKS! Books! Books! No matter what you want in the book line, I can fill your order. If you can not find the books you want, send 25c in silver for my book catalogue today. Levi Bryant, 654 East 44th St., Chicago, Illinois.

BURIED TREASURE

TREASURE Seekers—Learn scientific methods, Wyss, 104½ Francis, St. Joseph, Mo.

BUSINESS OPPORTUNITIES

THE PLASTEX Industry needs manufacturers on small scale and for big production of Art Goods, Novelties, Souvenirs, etc. in Plastex and Marble imitation. Experience unnecessary. 2c material makes 25c articles. Rubber moulds furnished for speed production. We place orders and buy goods. Small investment brings big returns. Interesting booklet mailed free. Plastex Industries, Dept. R, 1085 Washington Ave., New York.

LEARN Rubber Composition mold making. No heat. No machinery. Inexpensive, durable. Great for novelty manufacturing. Imitation marble for casts, decorating, etc. All branches marbleizing and mold making taught. Dime brings mold and cast, rubber material for testing, assorted samples. Literature. Cowell Institute, Grayling, Mich.

MEN-WOMEN. Start making Donuts, Potato Chips, Salted Peanuts. Experience or expensive machinery unnecessary. Full particulars and instructions $1. Joyce Aid Co., Murphy Bldg., Salem, Ohio.

LIQUID MARBLE — Anyone can make! Colorful, glazed! Molded, brushed, sprayed. Rubberlastic molds. Composition flooring. Big money making these! Particulars free. Marbleizing Service, Edwardsville, Illinois.

LEARN all about casting marble novelties in rubber moulds. Cement secrets. Illustrated catalog and beautiful samples 3c. (So. Calif. business reserved.) John H. Payn. 945 Grande Vista Avenue, Los Angeles, Calif.

COMPLETE Chemical Service, Analysis, Formulas, Consultations. State Licensed Chemist. Twenty-five years' experience. Write for literature. W. L. Cummings, Ph.D., 428 Gordon Avenue, Syracuse, N. Y.

IF you have some spare room, a basement or garage where you can do light work, see our offer to Branch Manufacturers on page 145. Metal Cast Products Co., 1696 Boston Road, New York City.

BUILD Battery Electric Plants. With washer engine, Dodge generators. Operates lights, washer, water system. Build new batteries from old. Enclose stamp. Battery Laboratories, St. Paul, Minnesota.

START a profitable mail order business of your own. Pays up to $200 weekly. Capital or experience unnecessary, valuable introductory booklet free. Mail Order Service. S. Bound Brook, N. J.

FREE PAMPHLET describes 87 money making plans. Earn $20-$100 week. Your own business. Home or office. C & B Sales Company, 1580 Sherman Ave., Evanston, Ill.

EARN while learning—men—women—your own Cleaning—Pressing Business. Easy home training. Free Outfit Offer. D-52, Business Ownership Institutes, 2400 W. Madison, Chicago.

$0.50 BRINGS Plans for America's Fastest Selling Novelty. Material cost about $0.10. Sell for $5.00. Is not Junk. Bob's Shop, 927 High S. W., Canton, Ohio.

SOAP Making, Disinfectants, Insect Spray, Deodorants, Cleaning Compounds. Learn at Home. No Machinery Needed. C. Alexander, Sta. F, Milwaukee, Wis.

OPERATE Chain of vending and amusement machines. Be independent for life. Start small, grow big. M. Goodbody, 1826 East Main St., Rochester, N. Y.

OPEN a key-making shop. Start a permanent, profitable business with a small sum. No skill necessary. Write for particulars. Beisser Mfg. Co., 419 E. Fort, Detroit, Mich.

START Now. Make extra $1,000 next summer. Million bottles sold. Big Profits. Sunburn Remedy Formula 50c. Eastern Products, Box 115, Biddeford, Maine.

CASH: Listing Local Names. Interesting spare time home occupation. Complete working plans 25c postpaid. Publishers Bureau, 850 East 47th, Chicago.

THAXLY Technically-Tested Formulas, Practical Processes. Chemical Consultation. Analytical Service. Catalog free. A. Thaxly Co., Washington, D. C.

MONEY without canvassing! 3c stamp brings copy 60-page magazine spare-time opportunities, plans. $1 year. Ward M. Smith, Fergus Falls, Minn.

SIGNS and Showcards Easily painted with Letter Patterns. Large variety of styles and sizes. Write for free samples. John Rahn, B-2120 Neva, Chicago.

SOMETHING New. Make money building and installing burglar alarms; a real protection. Instructions and drawings 50c. Hodges, Waukegan, Ill.

HOW would you like to receive 100 letters a day, each containing a dime? Will send plan for 10c. Carl Greiner, 5112 N. Oakley Ave., Chicago, Ill.

FASCINATING, Profitable, Easy—Make tumblers, vases, dishes, etc. from bottles. Illustrated instructions 25c. Henry Estberg, Waupaca, Wis.

EXTRA DOLLARS daily at home. Sample with your name and address; instructions, 25c. Art Service, 35 Second Ave., Newark, N. J.

CASH Income Daily Resilvering Mirrors; Replating Metalware; Making Glass Signs. Portable Outfit. Sprinkle, Plater, 845, Marion, Indiana.

MEN, Boys, for 25c I will send you a plan that brought me 100 letters a day, each containing a dime. 4898 Division Road, Dearborn, Mich.

10,000 MEN Wanted to Supply Tourist Information on 1935 Highway Specials. Layouts, Assignments, 25c (coin). Apply Box 2621, Tulsa, Oklahoma.

LEARN How to make Money. Send for "Pointers on How to Make Money," free. Wm. M. Wells, 5624 Hub St., Los Angeles, California.

WOULD you like to receive $10 a day? I will tell you how, and send a new Plan for 10c. B. Daniels, Box 315, Chester, Mass.

CASH Each Week furnishing names—addressing postals. Contract-details, for dime and purple stamp. Frederick, A-8, Chesterhill, Ohio.

RECEIVE 100 Dimes Daily through mail. Three formulas and plans, ten cents. D. Imson, 133 81st, Niagara Falls, N. Y.

UNUSUAL Opportunity! Send 10c coin and receive 50 guaranteed money-making plans. Sales Service, Belleville, Kansas.

READY Cash from discarded inner tubes and drained auto oil. Instructions 25c each. Charles, 12-AK, Norwood, Ohio.

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AMATEUR cartoonists, earn $25.00 week, spare time, copying cartoons for advertisers. Three-M Syndicate, Argyle, Wis.

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CASH! Operate profitable spare time. Mail business. Complete plan 25c. Home, 1635 Bender Ave., Hamilton, O.

AMERICAN Homeworker Magazine. 50 pages opportunities! Three months' trial, 25c. Mailmarts, M-4, Cincinnati.

SELL by Mail! Books, Novelties! Bargains! Big profits! Particulars Free! H. Elfco, 525 South Dearborn, Chicago.

ONE "Pyramid" Plan completed pays you $2,952.00. (Homework). Plan 25c. International Agency, M-4, Cincinnati.

GET Barrels of Mail. Your name in 10,000 Opportunity Directories, 25c. Roservice, 4627 Glenshade, Cincinnati.

AMERICAN Homeworker Magazine, 50 pages opportunities. Three months' trial, 25c. Mailmarts, M-4, Cincinnati.

3 PRACTICAL Methods of starting a business, 25c coin. Not formulas. C. Sherman, Station "C", Milwaukee, Wis.

LARGE, steady profits. Make products yourself. Catalog free. Allied Research, 2217 N. Kilbourn, Chicago.

COPY of money-making plan. 100 dimes a day. Enclose 10c. E. Binkelman, 4626 Scotten Ave., Detroit, Mich.

MAKE PRODUCTS yourself. Tested formulas — catalog free. Grinstead Laboratory, Edwardsville, Illinois.

HOMEWORK Opportunities from everywhere all year! 25c. Bluegrass Bureau, M-4, Newport, Ky.

STEADY Income from drained auto oil! Instructions 25c. International Agency, M-4, Cincinnati.

FREE Radios—make money giving them to friends—details 10c. Ferguson, 2840 Bailey, New York City.

WHOLESALE Supply Sources, half million items! 10c. International Agency, M-4, Cincinnati.

INVENTION Finance Magazinette, 5-H Beekman Street, New York. Sample copy sent upon request.

TATTOOING Outfits, Supplies—Catalogue. Guaranteed Remover. "Waters," M-965 Putnam, Detroit.

PARTNER Wanted! Help Operate Profitable Mailorder Business. Duffy-Co., Covington, Ky.

FOR UNEMPLOYED. Guaranteed money making plan. 25c (coin). Box 135, Auburn, Maine.

EARN $20.00 per 1000 mailing circulars at home. Write, Euvico, 434 Walnut, Statesville, N. C.

CASH Earnings positively guaranteed! No canvassing! Rush dime. Mailmarts, M-4, Cincinnati.

COLLECT Old Spark Plugs. Worth 3c. Details 10c. Goldenrule, Kalamazoo, Michigan.

BIG handful of new formulas! Quarter brings them today. Dowling, Dunellen, New Jersey.

NEWSPAPER Clippings Pay. Information 25c. Goodall, Box 1592-P, San Francisco.

MAKE mirrors from old window glass. Complete instructions, 25c. Westcott, Clyde, N. Y.

BE INDEPENDENT, Easy money-making plans 20c. Dowling, Dunellen, New Jersey.

MEN-WOMEN interested earn money home, write Eller, F-277 Broadway, New York.

DOLLARS Daily! No Selling. Facts, other offers, 10c. Int'nat'l Agency, Cincinnati.

"SELL Neat Letterheads. 1000—$1.99. $5 Hour. Dodds-V, Cedar Rapids, Iowa."

EARN $5 Daily. Instructions 25c. Pettit, 1379 Teller Avenue, New York.

$$$$ $40,000—I made it. Plan 10c. "Moore-Made," Lapeer, Mich.

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INCOME From your camera instead of expense. Low cost home course teaches you to make photographs for magazines, newspapers, advertisers. Tremendous demand. Earn good money wherever you live. Free book. Universal Photographers, Dept. A, 10 West 33rd St., New York.

FREE Photographic Bargain Book listing thousands of money saving values in Cameras, Lenses, materials, for still or movie pictures. Complete line at lowest possible prices. Central Camera Co., Dept. J4, 230 South Wabash, Chicago.

ALL-PURPOSE Camera, enlarger, and photo-taking equipment plans are in 1935 How-To-Build-It, 146-page book of home and workshop projects. Price 50c. Modern Mechanix Publ. Co., 529 S. 7th St., Minneapolis, Minn.

MAKE Money in Photography. Learn quickly at home. Spare or full time. New plan. Nothing like it. Experience unnecessary. American School of Photography, Dept. 2046, 3601 Michigan Avenue, Chicago.

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WE BUY used postage stamps from ordinary mail. Booklet (instructions, prices) 10c. Stamp Exchange, Dept. 53-A, Backbay Annex, Boston.

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MAKE you money—Outfits supplied, catalog 10c. "Mooremade", LaPeer, Michigan.

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CARTOONING Course—30 lessons, 500 Illustrations, with drawing pens and pencils. Postpaid. Complete $1.00. Scovell Studios, Box 610-M, Hollywood, Calif.

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LAUGH Producing Program, $1.00. Catalog free. Balda Art Service, Dept. 65, Oshkosh, Wis.

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FASCINATING Chemistry Magazine contains loads of Experiments, News, Problems, Queries, Jokes. 5 cent stamp brings sample. Chicago Press, Dept. 105, 158 Carroll Ave., Chicago.

CHEMISTRY Magazine (Illustrated). 3 months 25c. 1015 High, Petersburg, Virginia.

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DISTRIBUTORS: A few quick easy sales daily nets you $58.00 weekly. Represent manufacturer—Latex—amazing self-sealing bandage that breathes. Wonderful demonstrator. Irresistible appeal. Exclusive territory. Neway, 24-G So. Clinton, Chicago.

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"DOG Training for Home and Stage," by Monty Collier, famous dog trainer contains over 80 interesting tricks, lessons in obedience, guarding, etc. 224 pages illustrated. At Public Libraries or order direct $1.50 postpaid. Scovell Publishers, Box 610-N, Hollywood, Calif.

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INCREASE Business. "Excellograph" Rotary Stencil, Clay, and Film Duplicators $3.85 to $37.50. Prints anything typewritten, penned, drawn, traced. Colors. Folder Free. Pittsburgh Typewriter Supply, Suite 519, Pittsburgh, Pa.

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USED Correspondence Courses and Educational Books sold or rented. Inexpensive. Money-back guarantee. Write for Free Catalog Listing 4000 bargains. (Courses Bought). Lee Mountain, Pisgah, Alabama.

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EXPERIMENTERS, students, homebuilders, instructors, C.C.C.'s Scouts. Electrical kits free (almost). Entertaining, educational, useful. No toys. Write Engineering Service Company, 3722 A Street, Lincoln, Nebraska.

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INSULATION, Wire, varnishes, supplies, etc. Send 3c stamp for bulletin. Auto Power, 412 S. Hoyne Ave., Chicago.

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FREE homesteads, some improved, forfeited; 18 states. Maps "700 Facts," $0.40. Box MY33, Modern Mechanix, 1501 Broadway, New York City.

FINGER PRINTS

FINGER Print Outfit $1; Professional in Wooden Case $2. American System, 219-F West 100th St., N. Y.

FIRE ALARMS

HERR Fire Alarms, operate, electric, doorbell; 75c each. Collinsville, Illinois.

FIRE ARMS

GUNSMITHS' Secrets—Bluing, checkering, engraving, etc., 25c. International Agency, M-4, Cincinnati.

FREE! Gunstock Checkering Tool. Send Dime for Postage, Packing. M-Duffy, Covington, Ky.

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MAKE Dipsies for use or profit. Free folder. Reading Instrument Co., Reading, Pa.

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FREE list of fly and leader makers tools and materials. Paul Young, 8065-4 Grand River, Detroit, Mich.

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BASE BALL, build exciting game of skill, batting home runs, pitching strike outs. Plan, instructions, rules, $0.25 coin. If wanted game ready to play, $2. Charles E. Wood, Highland, N. Y.

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INVENTORS: Send immediately for your copies of our new Free books, "Patent Protection" and "Suggestions on Selling an Invention". Sixty-eight pages of interesting facts. They tell how Patent Laws protect you; kind of sketch or model needed; simple steps to take without cost; how successful inventors have secured financial assistance; show interesting inventions; illustrate important mechanical movements. With books we also send Free Evidence of Invention form to help establish date of disclosure. Prompt service, reasonable fees, special deferred payment plan. Strictest secrecy. Thirty-six years' experience. Highest references. Write us today. The facts in our books are worth money to the man with a good invention. Address: Victor J. Evans & Co., Registered Patent Attorneys, 421-D Victor Building, Washington, D. C.

PATENTS—Before too heavy an outlay of time or money is made on an invention, a search of the Patent Office records should be made to determine as nearly as possible whether or not the same idea has been patented before. The cost of this search is small, while the value of the facts it uncovers is often considerable. We offer inventors and manufacturers a thorough, prompt, confidential search service—plus experienced counsel and assistance in every phase of Patent and Trademark practice. Write for my new free book containing valuable information relating to patent procedure. Clarence A. O'Brien, Registered Patent Attorney, 28-T Adams Building, Washington, D. C.

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YOUR INVENTION will work if you get the right speed, weight, temperature, pressure, strength, etc. Let an engineer figure it out. Very reasonable. Absolutely confidential. James Bryant, Jr., Port Huron, Mich.

DESIGNING, drawings, blueprints, working models, commercial development of inventions. Reasonable prices. Satisfaction guaranteed. Engineering Service, 1519 Crescent Ave., Ft. Wayne, Indiana.

INVENTIONS now salable before patenting. Safe, practical. What have you? Chartered Institute, Dept. 5, Barrister Building, Washington, D. C.

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INVENTIONS—patented, unpatented. Bought outright, royalty. Write Arellano-Power Company, 160 North La-Salle St., Chicago, Ill.

PROTECT your idea! Forms and instructions 25c (coin). Write E. H. Neuser, 924 Buffalo St., Manitowoc, Wis.

INVENTORS—Large list, inventions buyers and wanted inventions, 25c coin. Theo Hines, Chapel Hill, Texas.

LEARN why most inventors fail, 25c coin. Hanchock Laboratory, 3943 Oliver St., Detroit, Michigan.

FORMULAS

425 TESTED Chemist Formulas (duplicate standard household, medical, cosmetic, auto specialties—easily, cheaply.) $1—$100 sellers! Mfrs., Agents, Mail Order Supply Directory. 42 sections successful miscellaneous money making schemes, advertisements, general information—in new, enlarged "Twentieth Century Business Encyclopedia." $1.00 postpaid. Interesting folder for stamp. A. K. Fuller, Box 1144A, Kalamazoo, Michigan.

SENSATIONAL discovery. Send 10c for package of Fixall, mends everything in household and factory. Simple formula making plastic wood 25c. Hopps Laboratory 286, Wythe Avenue, Brooklyn, New York.

READ "Spare-Time Business Builder"—Money-making Plans, Formulas each issue. Copy 10c. Halspence Exchange-M, 509 Fifth Ave., New York City.

THAXLY Technically-Tested Formulas. Practical Processes. Chemical Consultation. Analytical Service. Catalog free. A. Thaxly Co., Washington, D. C.

RECOVER Gold from Gold Plated Articles With Acid and Electricity Formula $1.00. Joseph Dorsney, Station J, Box 2614, Philadelphia, Pa.

HARDSCRABBLE RELISH — Ideal for home manufacture. Formula, working plan $1. Acorn, 3521 Wallwerth, Toledo, Ohio.

GOLD. Produce artificial gold by new method. Complete formula, $1.00. Mavis Mailway, 709 S. Monroe, Bay City, Mich.

! ! ANY FORMULA 50c! Three $1.00! Guaranteed! Personal Service! ! T-S-G-Publ., Box Ten-M, Wilkinsburg, Pa.

START Your Own Business. 50 money making formulas. Send two dimes. Rehm's, 34 Nichols St., Bridgeton, N. J.

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Building Stratosphere Air-Liners

[*Continued from page* 34]

in a concrete mold. The resulting streamline fuselage has not been amenable to improvement. The fuselages of the ships that are cutting airmail times in half today are built on forms of a principle laid out 16 years ago!

Right back into the stratosphere again!

We can build a ship for it now. We'll be flying it within a very few years; possibly months. And the speeds, the comforts, the unusual travel factors introduced by actual 400 mile an hour speed will put the stratosphere transcontinental air-liner in a class where it will make today's airmail planes look just as sad as today's ships, today's comforts and progress make the old DH-4 Liberty airmail planes look.

Strato-Liners to Resemble Modern Transports

The present twin-motored transports are 60 to 80 feet in span, and 40 to 50 feet long. For stratosphere flight a plane would have to be a real passenger carrier, and it would have seats above and below the mid wing. It would be double decked, so to speak. It would be more than 100 feet in span, and over 60 feet in length. Those are the major outward differences. Inside the ship is where most of the radical engineering departures will be seen. Why the changes?

Take today's airplane up to 50,000—75,000 feet (supposing you could get it there) and what would happen? A number of ridiculous things.

For one thing, the engine would slow down and die. If you happened to supercharge it so it could breathe sufficient air to burn a normal amount of gas, it would run away with the propeller and would wind up at a fearful rate, probably breaking a crankshaft and throwing connecting rods all over the country-side.

It would be a problem to *keep the motor warm.* Oils, to be effective, must run at 350-450 degrees, and the cylinders themselves must be that warm to obtain thermal efficiency from the gasoline heat energy which is doing the work.

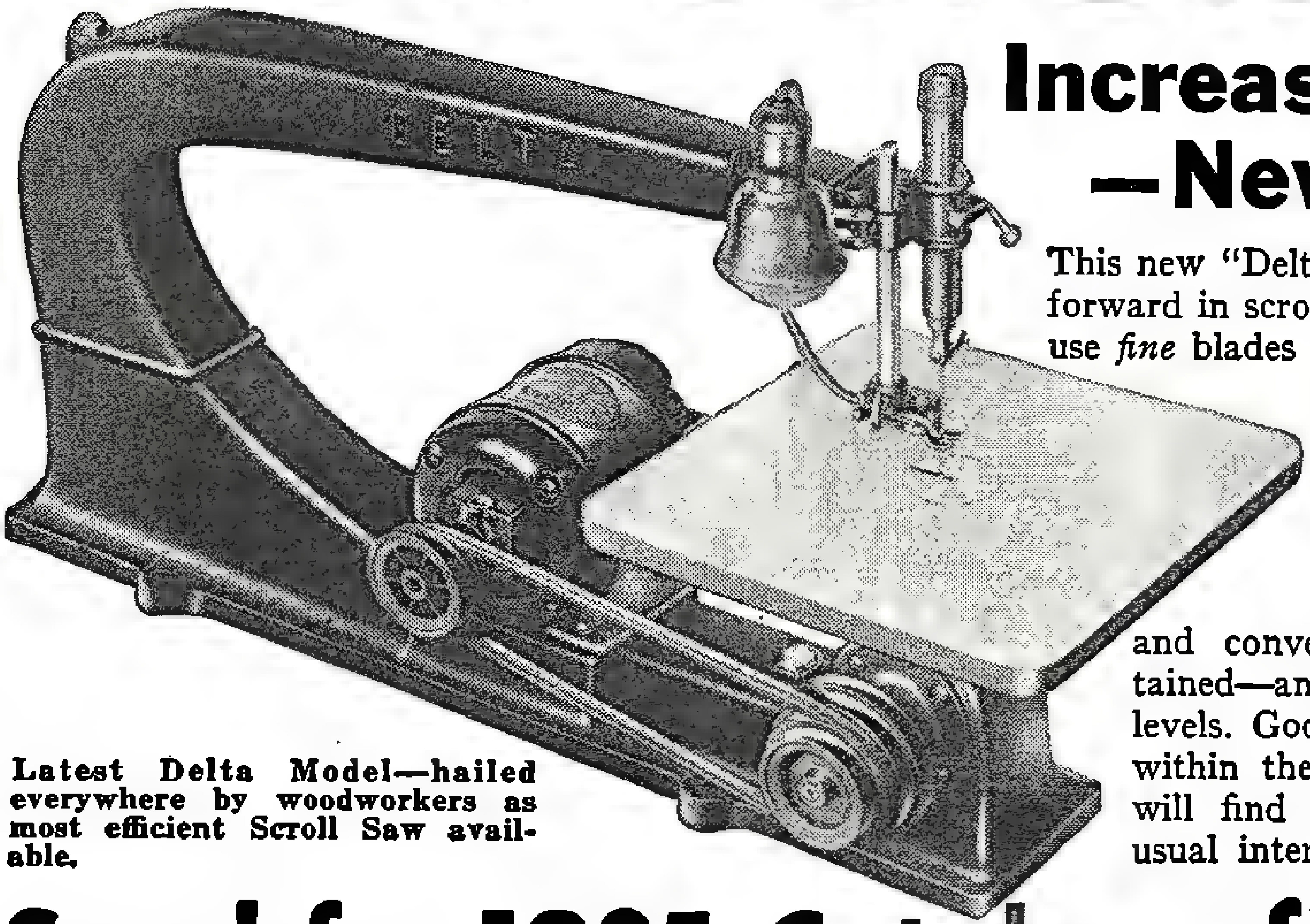
Ice on Wings Creates Problem

The tires of an ordinary ship would probably blow out. The people in the cabin would suffer the bends—a nausea and bleeding due to insufficient oxygen and deficient air pressure. And the ship itself would load up with a ton of ice in no time.

What is more, the ordinary airplane of today could travel only in one direction. A 200 mile an hour airplane could make it overland at 400 miles an hour from California to New York. Then when it had performed the phenomenal feat of going from Los Angeles to

[*Continued on page* 142]

New Scroll Saw



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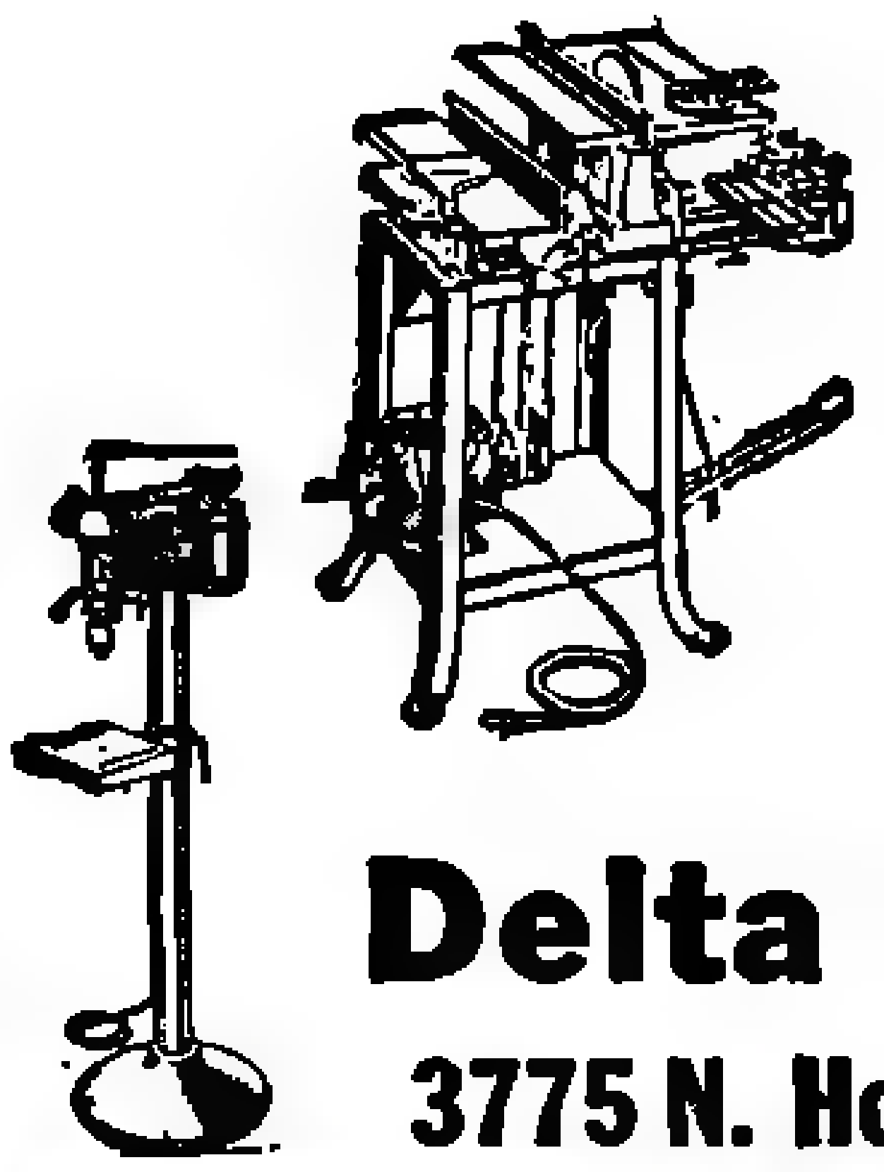

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DELTA MANUFACTURING COMPANY
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Large Royalties Offered Inventors

[*Continued from page* 81]

The trouble with the electric gasoline gauges of today is that they are not strictly accurate but depend somewhat on the inclination of the car. Nor are they accurate at the extreme ends of the scale. A remedy for these errors would be a money-maker.

We have still to see the automobile with the safe adjustable steering wheel that can be arranged quickly to meet the demands of the driver whether he be tall or short.

A little attachment for carburetors that would remove or prevent the flow of water would be a winner. Many an automobile is stalled by water (even a single drop) in the bottom of the carburetor. Such a device would be worth a great deal to the automobile industry with a resultant value to the inventor.

A thermostat that could be adjusted to function between certain definite limits by a small screw to replace the type that trips at a single temperature would be quite valuable.

A little thermostat that would automatically turn on a small electric heater under an automobile engine when the temperature of the garage dropped to a certain critical point would be worth a great deal of money. It would prevent freezing and facilitate quick starting on cold days.

A little device that will drop glycerine on the windshield wiper during sleet storms will sell fast. This would drop glycerine under the windshield wiper where it would be worked over the surface of the glass to permit better vision.

Building Stratosphere Air-Liners

[*Continued from page* 140]

New York in 6 hours, it could make the return trip quicker by coming back to Los Angeles via London, Constantinople and the Hawaiian Islands! That is because a 200 mile an hour ship flying against a 200 mile an hour wind stays in the same spot.

Temperatures are way down, about 50 degrees below zero F.—this means we've got to build a flying ice box to keep the passengers *warm.* And we must keep the engines warm —normal operating conditions must be artificially supplied. We'll have to design something that will take the ice off wings as fast as it is formed. The sweating of windows, the forming of fog within the cabin, all will have to be accounted for by a separate de-icing, cabin warming, pressure furnishing plant that will run independently of the main motors.

This pressure furnishing feature will probably have to function in the manner of the air conditioner. It will not do to use air bottles, because they are too heavy. The cabin space

Building Stratosphere Air Lines

must be a chamber which has intakes and exhausts for *conditioned* air. The link between the cabin and the outer air will be a conditioning plant.

Because of the low pressures, variable area as well as variable pitch propellers will have to be used. Such devices on the business end of an engine will be comparable to the gear shift on a car.

Purely in the matter of borrowing from terrestrial aviation what appears to be good practice, I would use two motors in my stratosphere plane design. They would be supercharged, air cooled, and of the in-line type. This type is slightly cheaper to manufacture, is more robust, and easier to service. The major qualifying point which is now bringing such motors back into their own is that they streamline into a wing so well.

By putting the wing at the middle of the fuselage, making it a mid-wing ship, streamlining the motors into the wing, and allowing a retractible landing gear which can be folded to the wings to lessen air resistance, we will arrive at the design of the ultimate airplane.

Yes, that stratosphere ship will be unique—a flying wing that will whisk people about so rapidly they'll scarcely need to eat from coast to coast.

We may have to educate a new breed of passenger, but the knowledge, materials and men to build and fly the stratosphere air-liner are here—right now!

How I Judge Championship Fights

[*Continued from page* 121]

addition of two judges was a forward step. Permitting a referee to be the sole judge of the fight would be like putting all your eggs in one basket and would accomplish no lessening of squawks on decisions.

The argument was advanced that the referee is always sufficiently capable of handling the situation, and that too often the judges are incompetent. Granting that the referee may be sufficiently competent, I do not adhere to this theory.

I admit that now and then there is an incompetent judge, but this is one of the fallacies of boxing, and to improve the game there must be precaution in the selection of officials.

There is only one solution to the numerous decision controversies occurring in various parts of the country. That is the Illinois scoring system, which will become universal when other boxing bodies realize its fairness and effectiveness.

Add to this the careful selection of officials and a campaign of boxing education to the fans and we will have a better sport.

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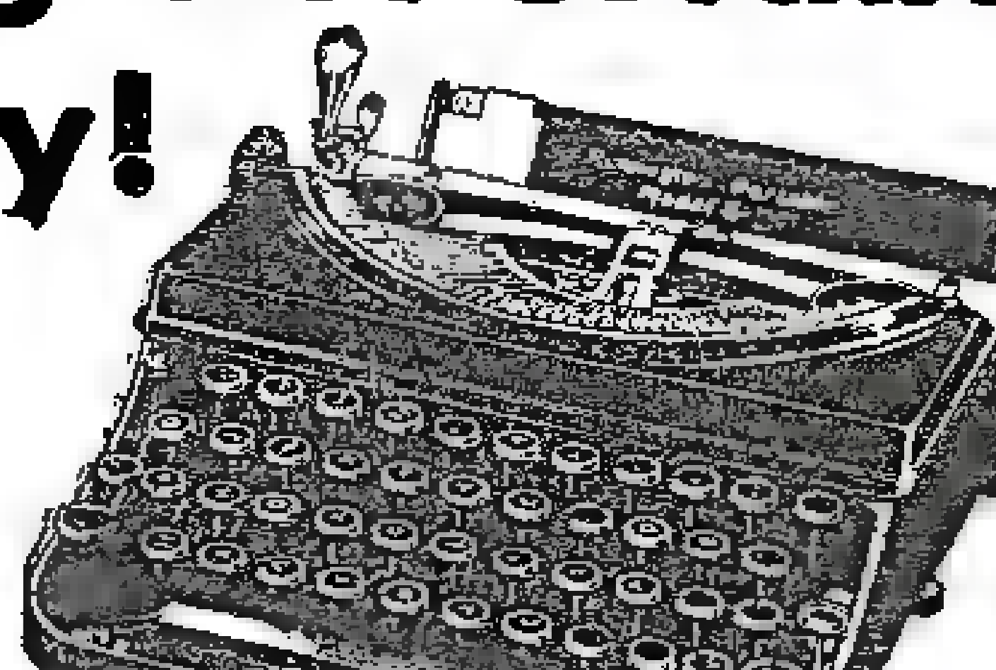

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INVENTORS
SEE PAGE 12

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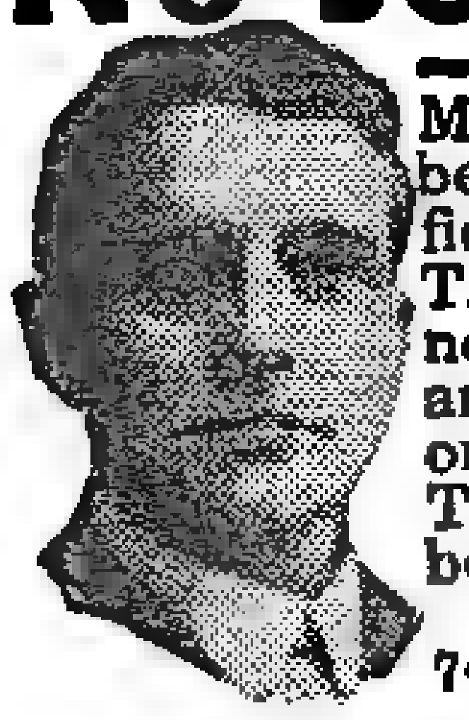

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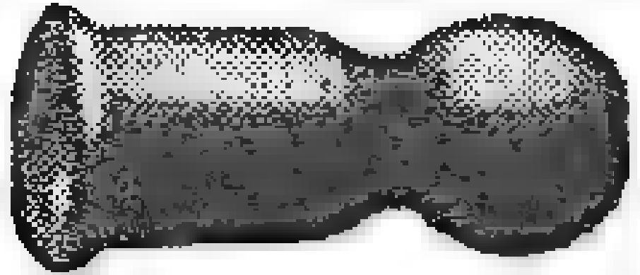

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Racing Time For News Scoops

[*Continued from page* 45]

in each country. Each bureau has a staff of editors, rewrite men and reporters. In addition "string" correspondents in towns and villages in the bureau's territory send news on a "free lance" basis to the bureau. Anyone can sell worth-while stories to press associations, if he has the story first. If the news is purely regional, the bureau rewrites the story and sends it by telegraph, telephone, or automatic printer only to the client newspapers in its territory.

New York Controls Press Network

If the story is of international importance, it is cabled to all key bureaus which in turn relay it to all client papers in their countries.

In the United States the United Press operates a network of telephone wires leased from the American Telephone and Telegraph company. These wires reach every section of the country and enter every newspaper office served by U. P. Each bureau in the country has sending machines and operators who punch stories on the tape of automatic printer machines. The same machine also receives; similar machines are located in every client newspaper's office.

From the time service starts until it ends these machines are always going, neatly typewriting the news of the day on a continuous roll of paper. The New York bureau controls the wire. If it has the best story of the moment, it takes the wire and its operator runs his tape through the machine until the story is completed. As stories break in various bureaus they send schedules of the stories to the New York office. The New York chief editor selects the best ones and tells each bureau when it can send a story.

"Hot" Story is a Bulletin

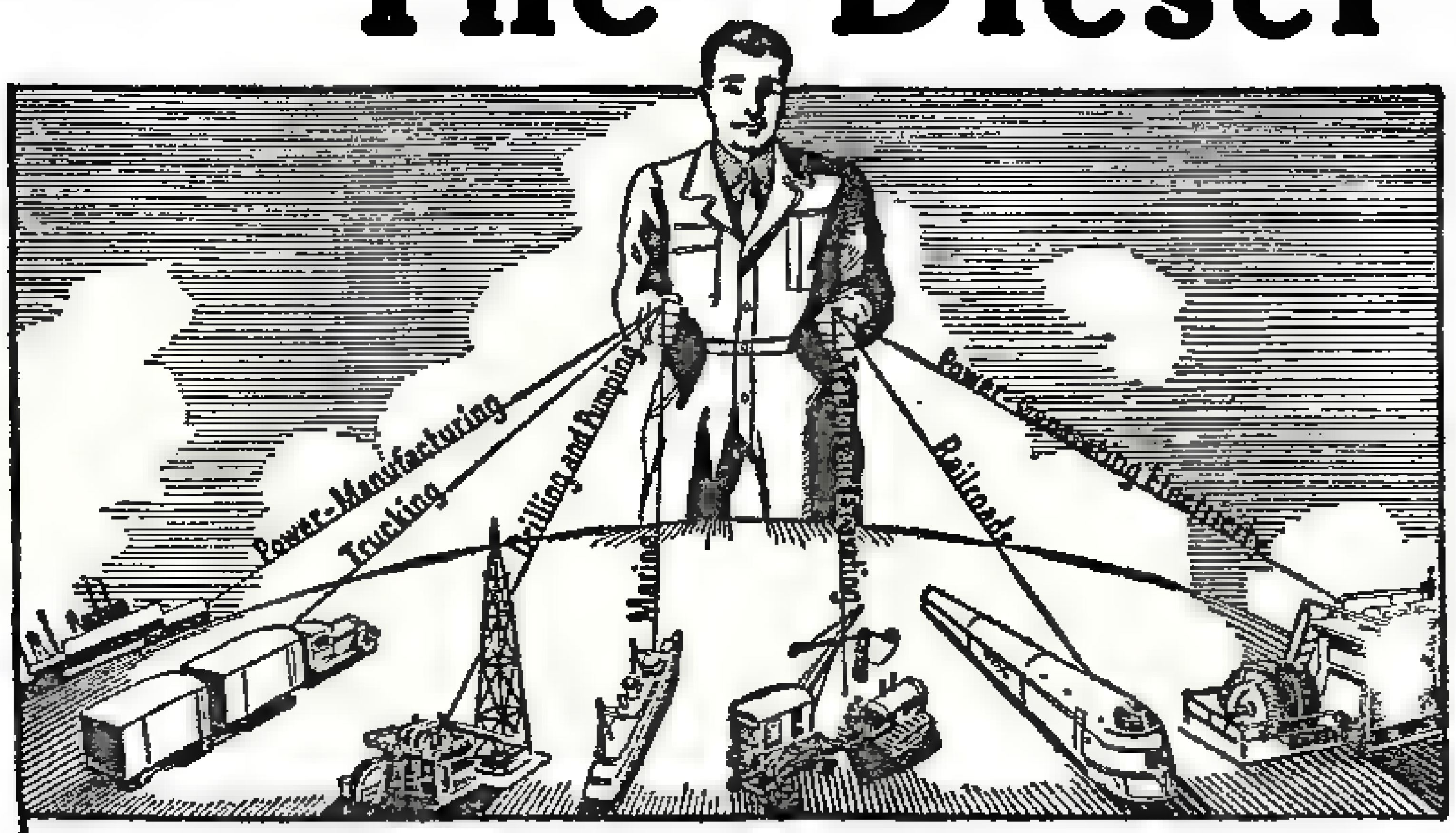
If a bureau has a "hot" news story, it waits until the story on the wire reaches the end of a "take," which is seldom 23 lines long, then the operator in that bureau breaks into the line with a "bulletin" bell signal and sends one or two paragraphs of the story.

In the client newspaper office copy editors continually tear printed copy from the machine, select the news wanted, edit it to the desired length, write headlines for it, find a place for it in the "dummy" of the day's paper, send it to the composing room where it is set up, put in the forms and finally sent to the press.

The bureau that has a "flash" story breaks into the wire immediately, stopping any story that may be moving on the wire. The bureau sends the "flash," then holds the wire for the subflash which follows immediately.

[*Continued on page* 148]

The Diesel Engineer



Diesel engines—because of their high efficiency, dependability and economy of operation—are fast replacing steam and gasoline engines in power plants, motor trucks and busses, locomotives and ships, tractors, dredges, drills, pumps, etc.—opening up steady, well-paid jobs for Diesel-trained men.

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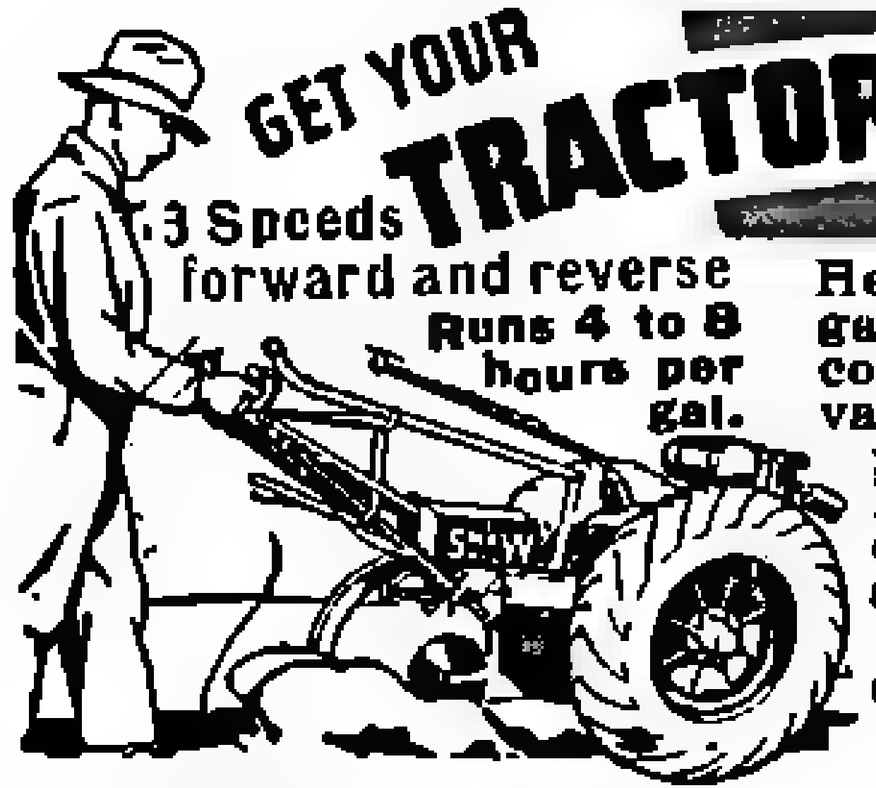

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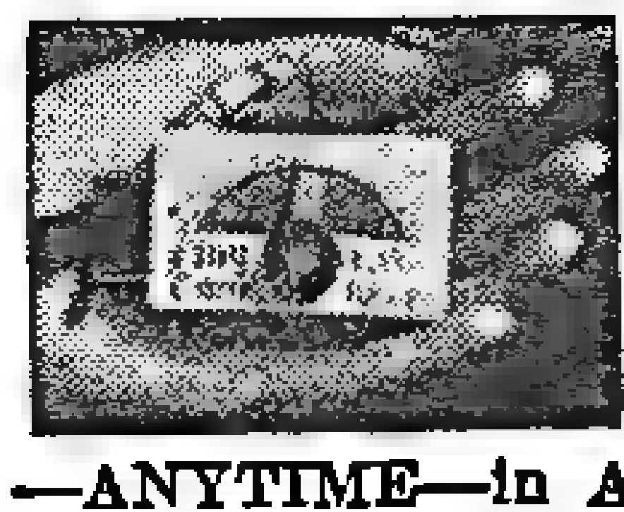

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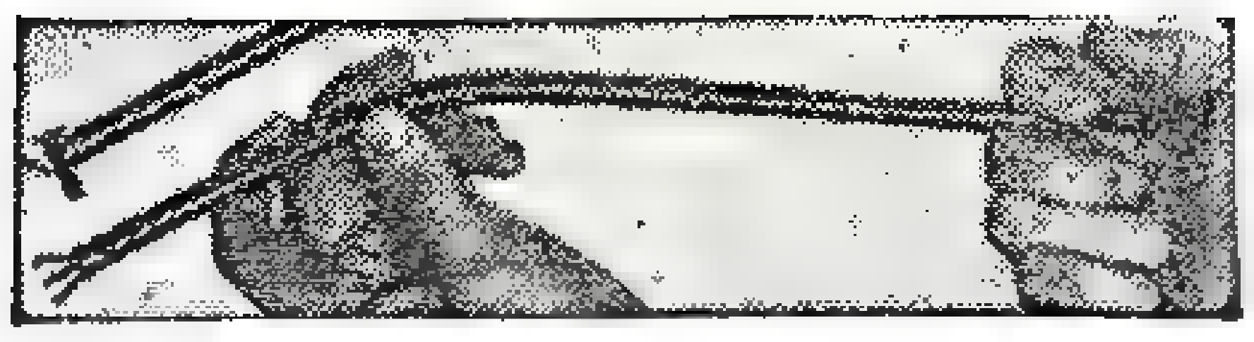

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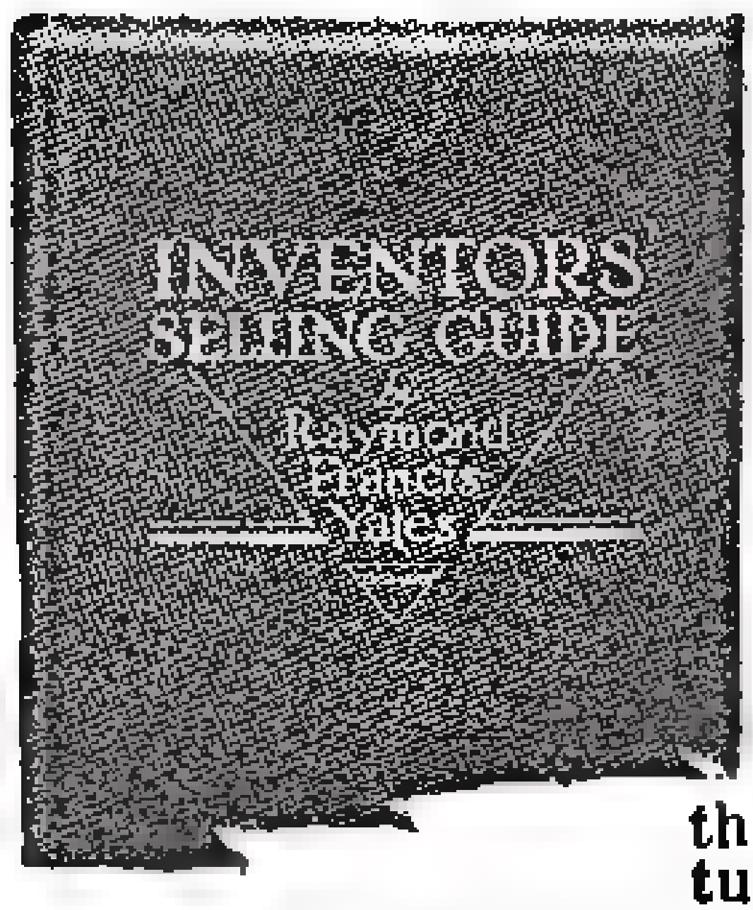

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Clipping Dollars From Auto Costs

[*Continued from page* 123]

thousand miles, the ignition has sparked 8,500,000 times; the valves have lifted 17,000,000 times; the pistons have traveled 2,100 miles, and the carburetor has rapidly split four hundred pounds of gasoline into 8,500,000 accurately measured jets of gasoline, expanding each drop by adding from 12 to 15 times as much air. All this calls for inspection and adjustment at intervals.

The lesson regarding speed holds true for oil also. One engineer says that the average car driven continuously at 60 miles per hour uses 10 times as much oil as it does at 30 miles.

Compression Ratio Increased

The idea that heavy oil will last longer is not necessarily true. "Most of us have an exaggerated idea of the difference in consumption between, let us say, an SAE 30 and an SAE 50," says one leading engineer. "The difference is usually very slight. When an engine is designed to use light oil, its oil consumption will not be reduced noticeably by using very heavy oil."

As motor manufacturers have improved their cars to give more speed, acceleration, and power, they have been steadily raising the compression ratio—the amount the gasoline vapor that is squeezed in the cylinder before it is fired. The bigger the ratio, the more power generated.

But too much compression makes motor knock. For this reason, ethyl gasoline was introduced. Tetra-ethyl lead, chemists found, has the strange property of stopping knocks simply by checking combustion, slowing down the explosions and making the gasoline exert a push, instead of striking hammer-like blows.

Cool Motor Saves Gasoline

The octane number indicates how strong in anti-knock a fuel is.

High-compression motors require an anti-knock gasoline. The higher the ratio, the higher the octane number that should be used.

Learn your car's compression ratio, for it will tell you whether your car needs ethyl gasoline, or can use the cheaper grades just as well. One leading refining company recommends its standard grade for cars whose compression ratio is 5½ to 1, or less, and its ethyl gasoline for cars with a ratio of more than 5½ to 1. Third-grade gasoline is suitable only for cars with low compression ratios.

The hotter an engine is, the higher the octane number it will need to prevent knocking. A motor which does not knock at 100 degrees with 65 octane number, will knock at 200 degrees on any fuel less than 85 octane number. Keep your motor running cool and save gasoline. This means correct timing, clean spark plugs, clean valves.

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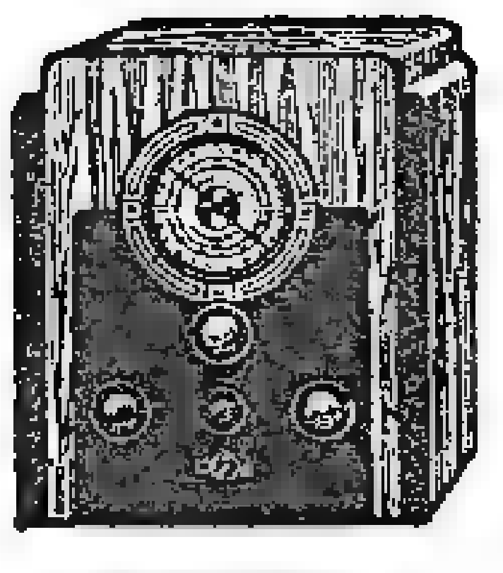

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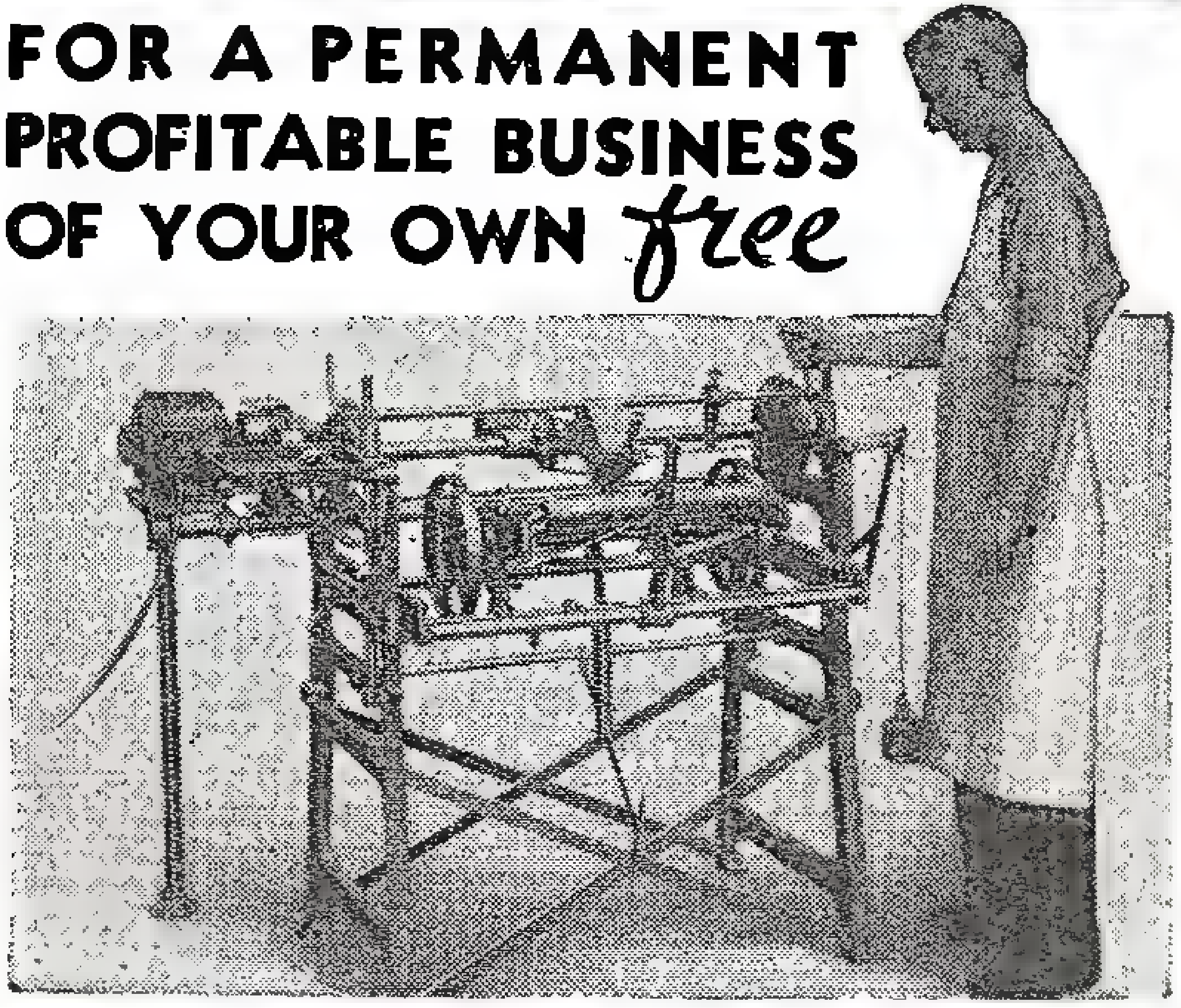

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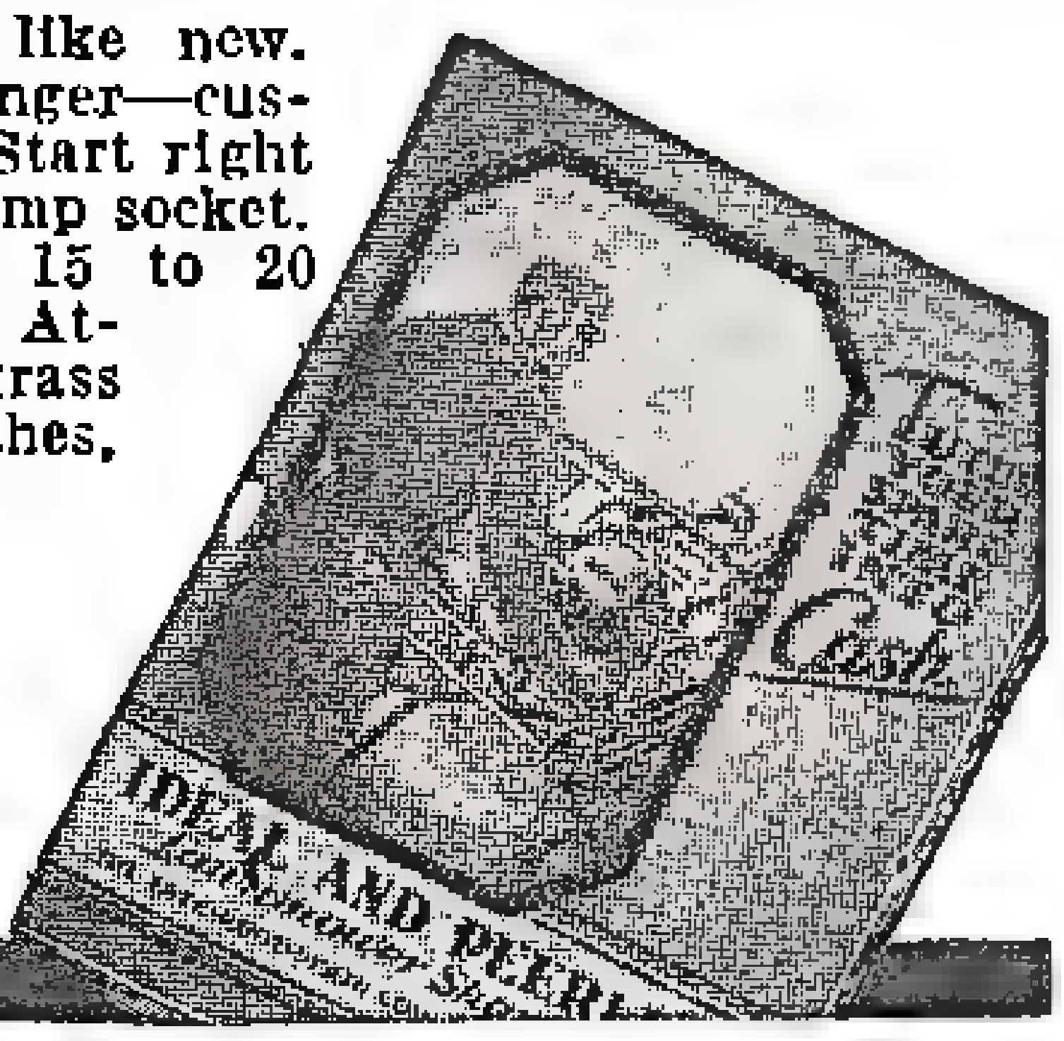

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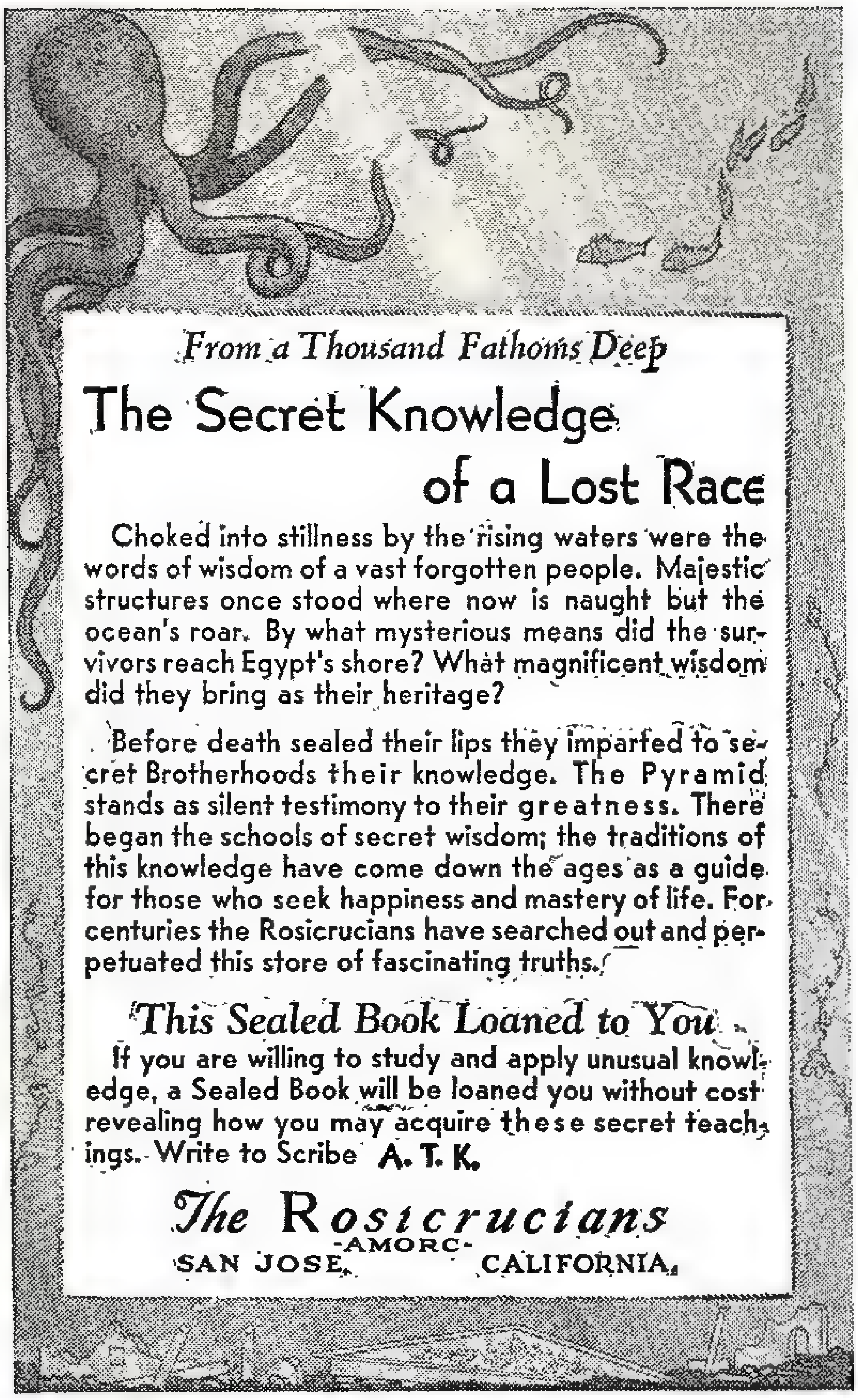

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The Secret Knowledge of a Lost Race

Choked into stillness by the rising waters were the words of wisdom of a vast forgotten people. Majestic structures once stood where now is naught but the ocean's roar. By what mysterious means did the survivors reach Egypt's shore? What magnificent wisdom did they bring as their heritage?

Before death sealed their lips they imparted to secret Brotherhoods their knowledge. The Pyramid stands as silent testimony to their greatness. There began the schools of secret wisdom; the traditions of this knowledge have come down the ages as a guide for those who seek happiness and mastery of life. For centuries the Rosicrucians have searched out and perpetuated this store of fascinating truths.

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Racing Time For News Scoops

[*Continued from page* 144]

News is the most perishable commodity in the world. In a few hours it is "stale." World-wide news agencies constantly battle time to be the first to get the news to the newspapers. A "scoop" on a big story sells newspapers and the press association that gets the most scoops will get contracts over rival associations with newspaper clients.

Where a newspaper must make, at the most, a half dozen deadlines per day, the press association is up against a deadline somewhere nearly every minute of the day. Serving newspapers in every time-zone of the globe, its dispatches are always going to press.

Prepare in Advance for Scoop

At 6 P. M. in New York, New York afternoon papers have finished their day, but afternoon editions are just beginning to roll from the presses in San Francisco, morning editions are being made up in London, while in Tokyo evening paper staffs are preparing for another day.

Competition to beat the ever-present deadline is keen. Scoring a beat over his rival is to a correspondent what winning a knockout decision is to a pugilist. And similarly, a beat is more often the reward of painstaking preparation than a "lucky break."

Months in advance the United Press began preparing for the possible death of Reichpresident Paul von Hindenburg. This foresight won a clean scoop on the story.

Scoring Beat on Hindenburg Death

Long before Hindenburg died, the Berlin office had laid down in London, New York, Buenos Aires and other points a complete background of obituary material, speculation on Hindenburg's successor and the political consequences of his death. During the three days before his death, the United Press lined up twelve sources for protection on the flash. Special arrangements were made to move urgent cables even faster than usual.

At 5:44 on the morning of his death came the final bulletin saying the President was in a deep coma. The United Press staff was mobilized in the office; correspondents waited at Neudeck, the President's home.

The Berlin office radio was turned on, but silent. Suddenly the announcer said, "We will transfer to the Propaganda Ministry." That was at 9:45. The bureau manager just got the telegraph office on the phone when his assistant, listening to the radio, cried out, "Hindenburg's dead." The bureau manager dictated the flashes for New York and Buenos Aires; they moved immediately. A later checkup showed that the one to New

[*Continued on page* 150]

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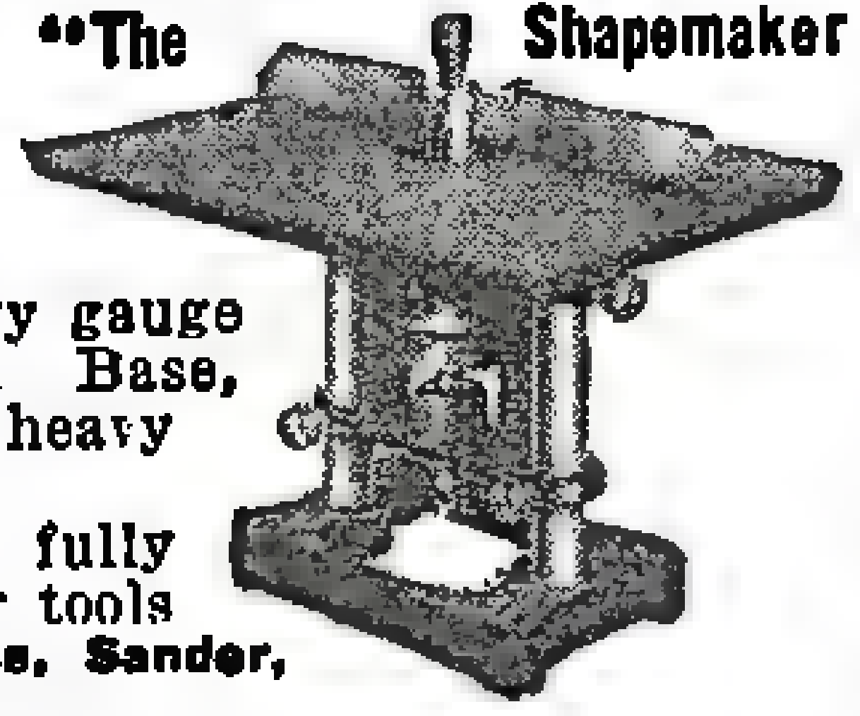

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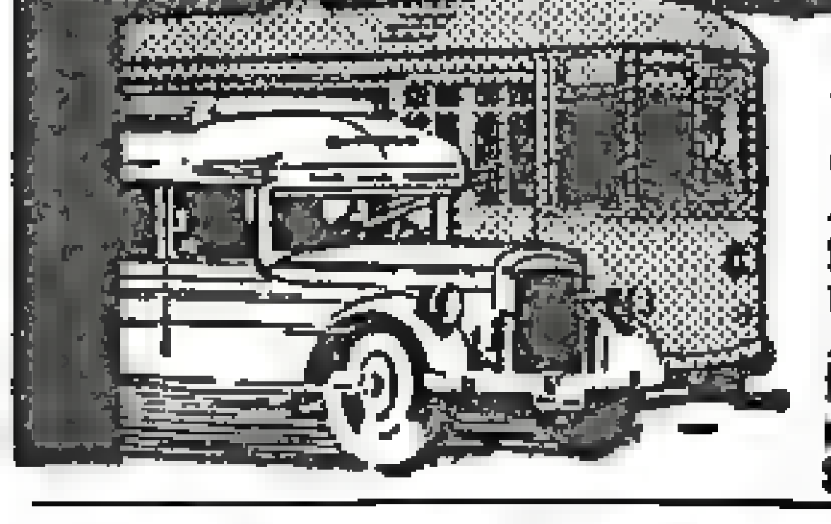

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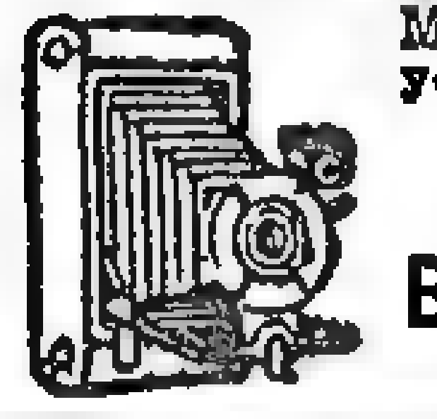

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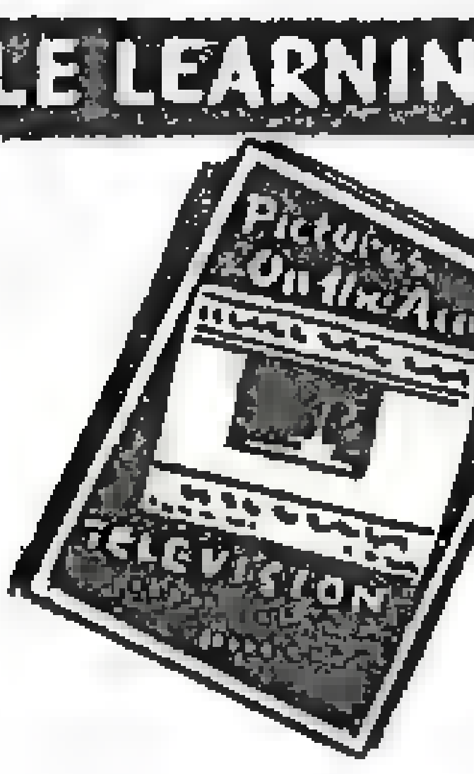

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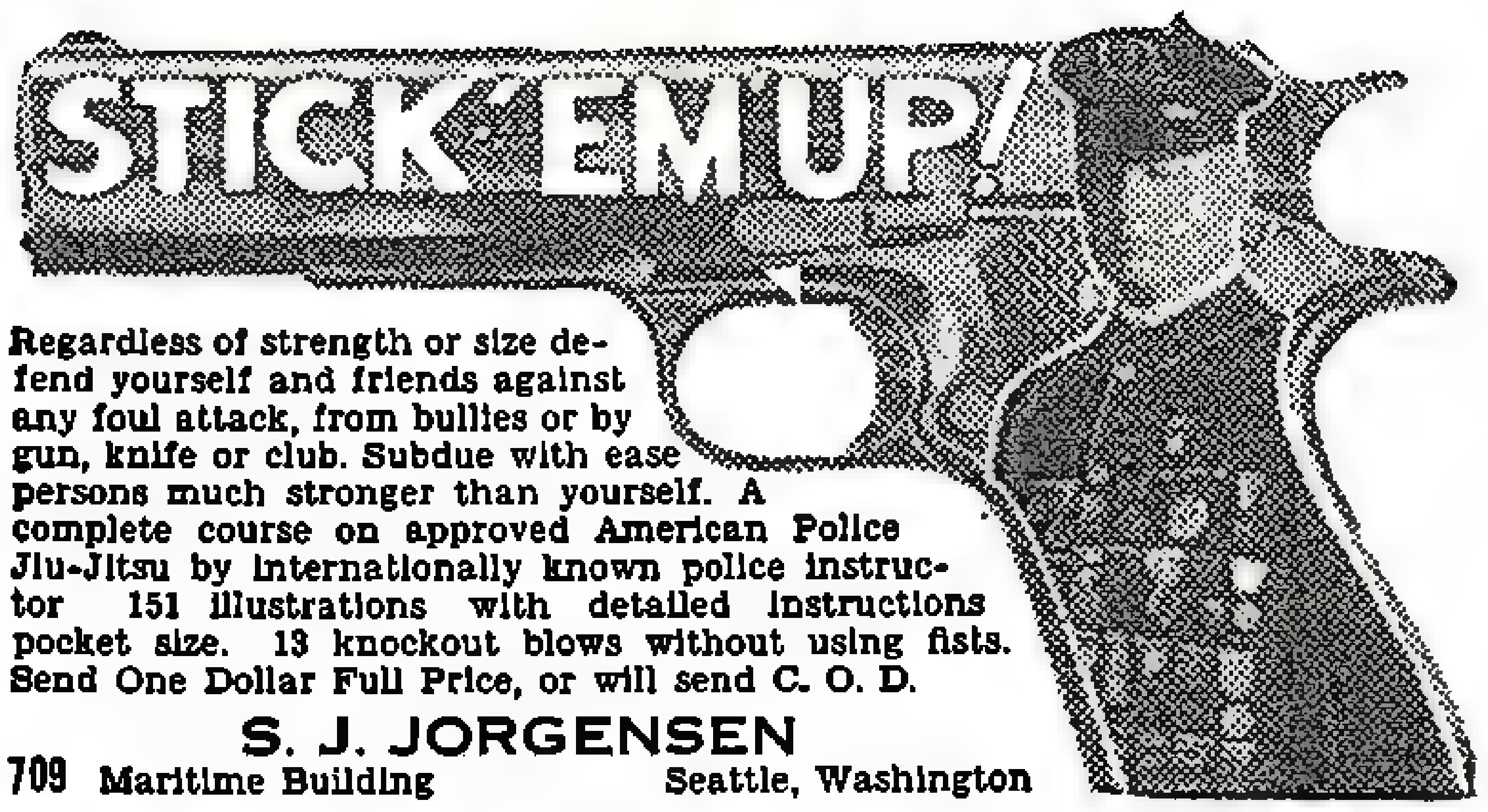

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INVENTORS SEE PAGE 12

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Racing Time For News Scoops

[*Continued from page* 148]

York cleared in two minutes and the one to Buenos Aires in three.

That radio announcement could have been heard by every correspondent in Berlin, but the United Press earned its beat by having facilities ready to move the flash.

Covering bloody uprisings and revolutions in various parts of the world has become, during the last decade, almost part of the day's work. Bill Lander was one of only two correspondents at the National Hotel during the Cuban revolt when the massacre of officers occurred (Oct. 2, 1933), and was the only one right in the garden where it took place. Here is Lander's description of the massacre:

Reporter's Story of Bloody Massacre

"It was around 5 P. M. when the embattled officers surrendered and most correspondents hurried to the cable offices to file their accounts of the battle. I had a hunch, however, that the story was still incomplete. I wanted to see conditions surrounding the surrender myself. Against orders, I got into the hotel garden through a back entrance, posing as one of a group of student leaders.

"I saw the surrendered officers, in civilian clothes waiting to be taken to prison.

"Suddenly and unexpectedly a rifle shot rang out through the palm trees from somewhere. Nobody knows yet who fired it. It set off a torrent of fire by soldiers from their rifles, sub-machine guns and pistols.

"There seemed no possible escape from being killed. I ran to a corner abutment of the building, then dodged further on behind a pillar of the porte-cochere.

Press Correspondents Are Every Where

"Officers fell to the ground, some of them mortally wounded. Around the corner I saw a student drop, never to get up. Horses jumped and reared. Soldiers began raising guns in the air and shouting, 'For God's sake, don't shoot,' But the shooting continued.

"Gradually officers imposed discipline on their men. The firing lessened and stopped.

"The garden was a shambles—dead and dying officers, many horribly wounded. I counted the exact number of victims.

"I reached my cab and drove to the cable office where, for nearly an hour I sat, wet with perspiration, writing the story of the massacre."

Wherever news is breaking—be it a speech by the President, a revolt in Spain, a fire at sea—there you will find a man with pencil and paper scribbling notes, one eye on the nearest telephone or telegraph office, eager to speed the news so that swiftly and surely your newspaper may bring to you the exciting, dramatic picture of life.

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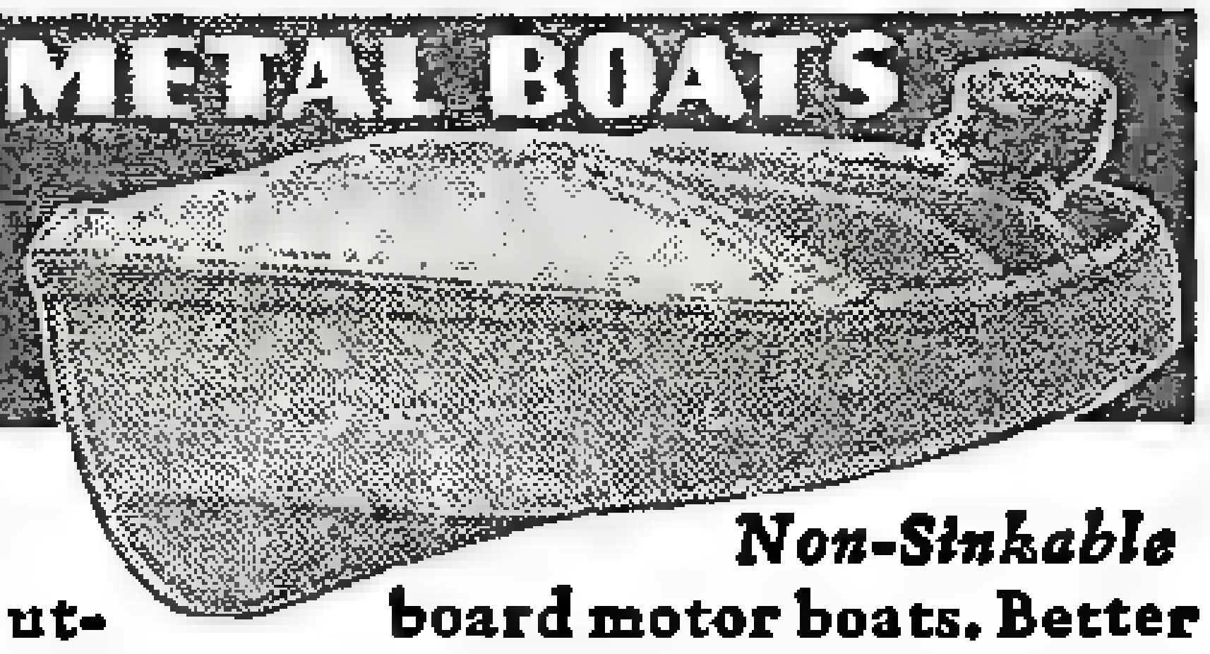

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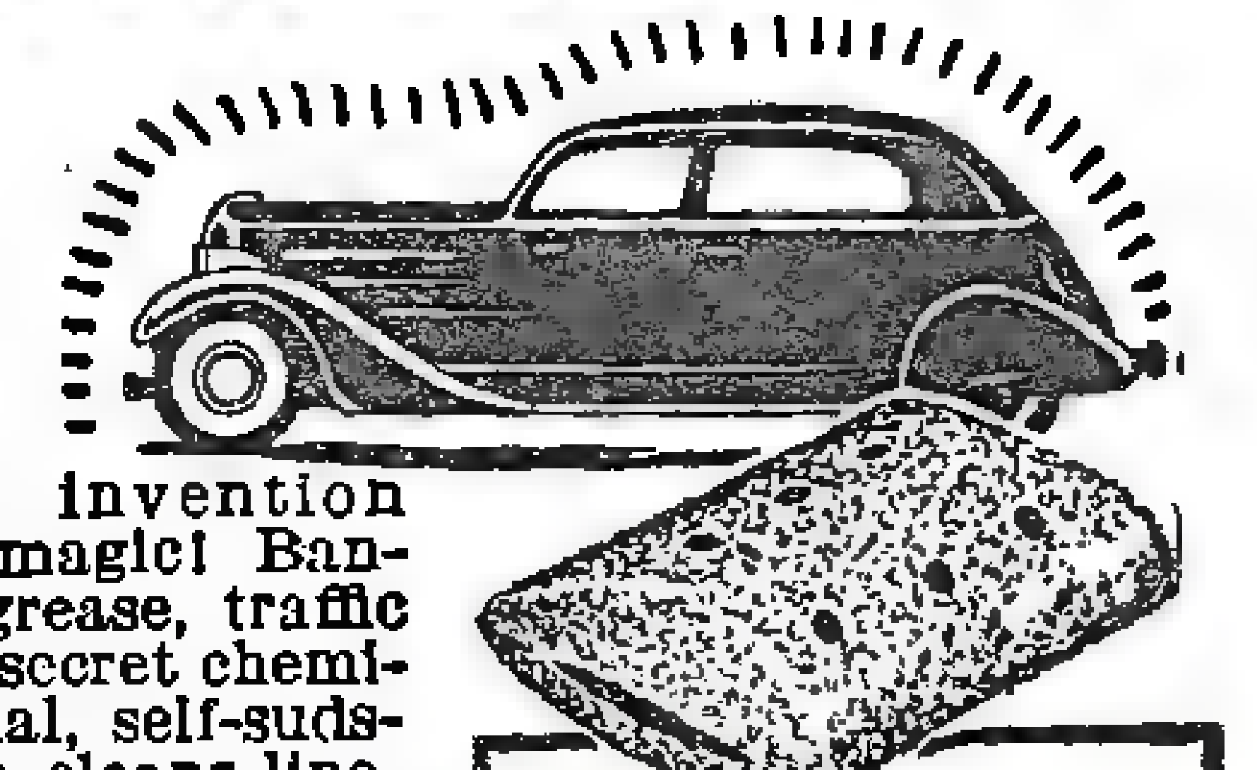
STRANGE CHEMICAL SPONGE



Revolutionary invention cleans autos like magic! Banishes dust, dirt, grease, traffic film—thanks to secret chemical and sensational, self-sudsing feature. Also cleans linoleum, woodwork and windows without work! Auto owners and housewives wild about this strange chemical sponge! **SAMPLE OFFER!** Samples sent at our risk to first person in each locality who writes. No obligation. Be first—*send your name today!*

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[Continued from page 55]

magazine racks easily reached by swinging out the hinged side panels.

Paying one dollars for the seat and eighty cents for necessary unholstery cloth, the total cost for materials comes to approximately six dollars. This figure includes all the plywood, fiber panels, wood, glue and nails needed. By using lumber and materials already at hand, you should be able to reduce costs considerably.

Make the wood frame first, carefully aligning all pieces before gluing or nailing. Build up the side frames by sawing out the curves on a band saw, gluing together, then sanding to a smooth finish. Diagonal braces in the base will give additional strength to your chair. Hardwood, if available, is to be preferred for all frame pieces.

Magazine Rack Panels Are Pressed Wood

Cut out the outer panels for the magazine racks from 1/4″ fiber or pressed wood material, after first transferring the design to your work. Simply draw 2″ squares on the fiber, then make the curves by following the squared pattern given.

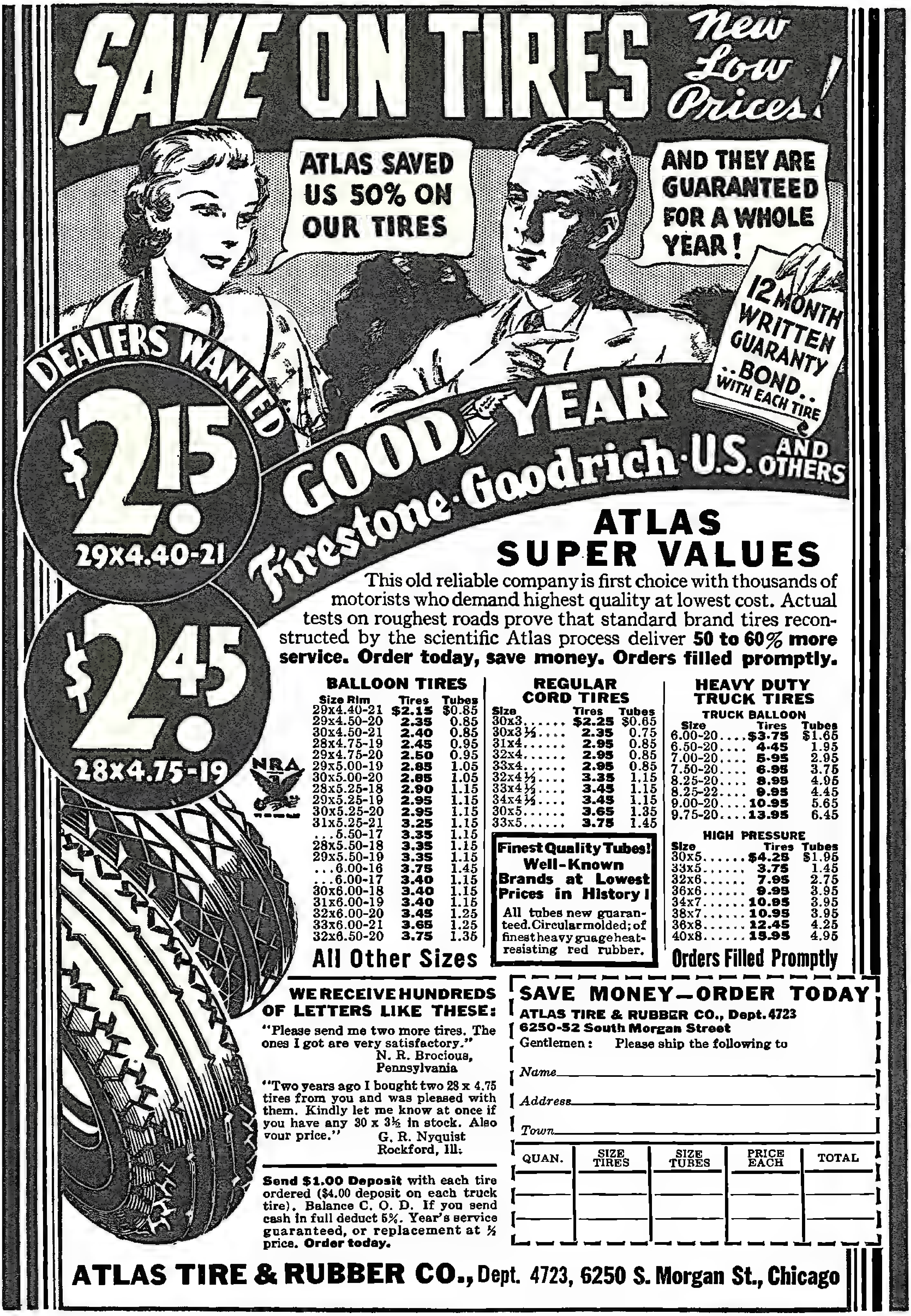
A rather novel method of hinging each magazine rack panel, known as a trunnion hinge, is used here. Stop blocks at each side of the outward swinging rack catch on similar blocks nailed to the inside of the arms and limit outward travel of the racks. Do not be confused by the dotted lines in the end view of the rack—they represent the front stop blocks, which are lower than the back ones because of the slope of the chair arms.

Avoid Wrinkles When Tacking Upholstery

New covering is applied to the auto seat and to the chair arms. Pad the tops of the arms either with cotton or horsehair, then pull the cloth smoothly over and tack underneath. It is a good idea to use the old covering of the seat here to hold the padding in place. When using heavy cloth, cut triangular notches out of the edges at sharp curves, to avoid bumps at the tacking edge. Do not tack heavily the first time, as you may want to return to smooth out wrinkles.

The legs may be taken from an auto seat or cut from wood, as you prefer. After all upholstery has been completed, set in the seat, and fasten to the wood frame with wood screws. To prevent the back of the seat from swinging forward too easily, clinch the hinges a bit with hammer and punch.

Leather tabs tacked to the tops of the magazine racks will make opening easy. The weight of the magazines themselves will keep the racks in closed position.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28x4.75-19	**2.45**	0.95
29x4.75-20	**2.50**	0.95
29x5.00-19	**2.85**	1.05
30x5.00-20	**2.85**	1.05
28x5.25-18	**2.90**	1.15
29x5.25-19	**2.95**	1.15
30x5.25-20	**2.95**	1.15
31x5.25-21	**3.25**	1.15
...5.50-17	**3.35**	1.15
28x5.50-18	**3.35**	1.15
29x5.50-19	**3.35**	1.15
...6.00-16	**3.75**	1.45
...6.00-17	**3.40**	1.15
30x6.00-18	**3.40**	1.15
31x6.00-19	**3.40**	1.15
32x6.00-20	**3.45**	1.25
33x6.00-21	**3.65**	1.25
32x6.50-20	**3.75**	1.35

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31x4......	**2.95**	0.85
32x4......	**2.95**	0.85
33x4......	**2.95**	0.85
32x4½....	**3.35**	1.15
33x4½....	**3.45**	1.15
34x4½....	**3.45**	1.15
30x5......	**3.65**	1.35
33x5......	**3.75**	1.45

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9.00-20....	**10.95**	5.65
9.75-20....	**13.95**	6.45

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Size	Tires	Tubes
30x5......	**$4.25**	$1.95
33x5......	**3.75**	1.45
32x6......	**7.95**	2.75
36x6......	**9.95**	3.95
34x7......	**10.95**	3.95
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QUAN.	SIZE TIRES	SIZE TUBES	PRICE EACH	TOTAL

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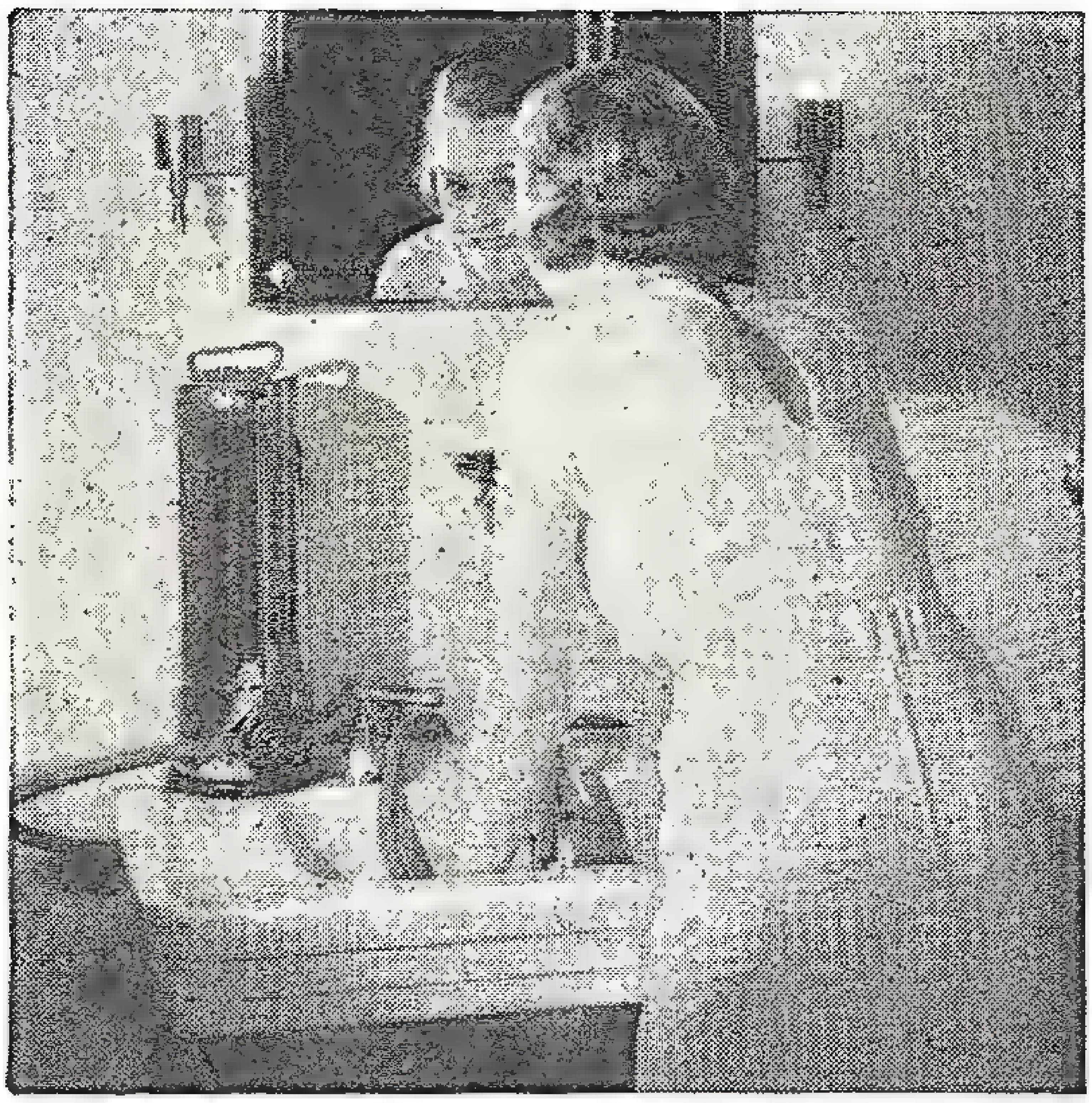
BUSINESS Converts New Ideas Into PROFITS



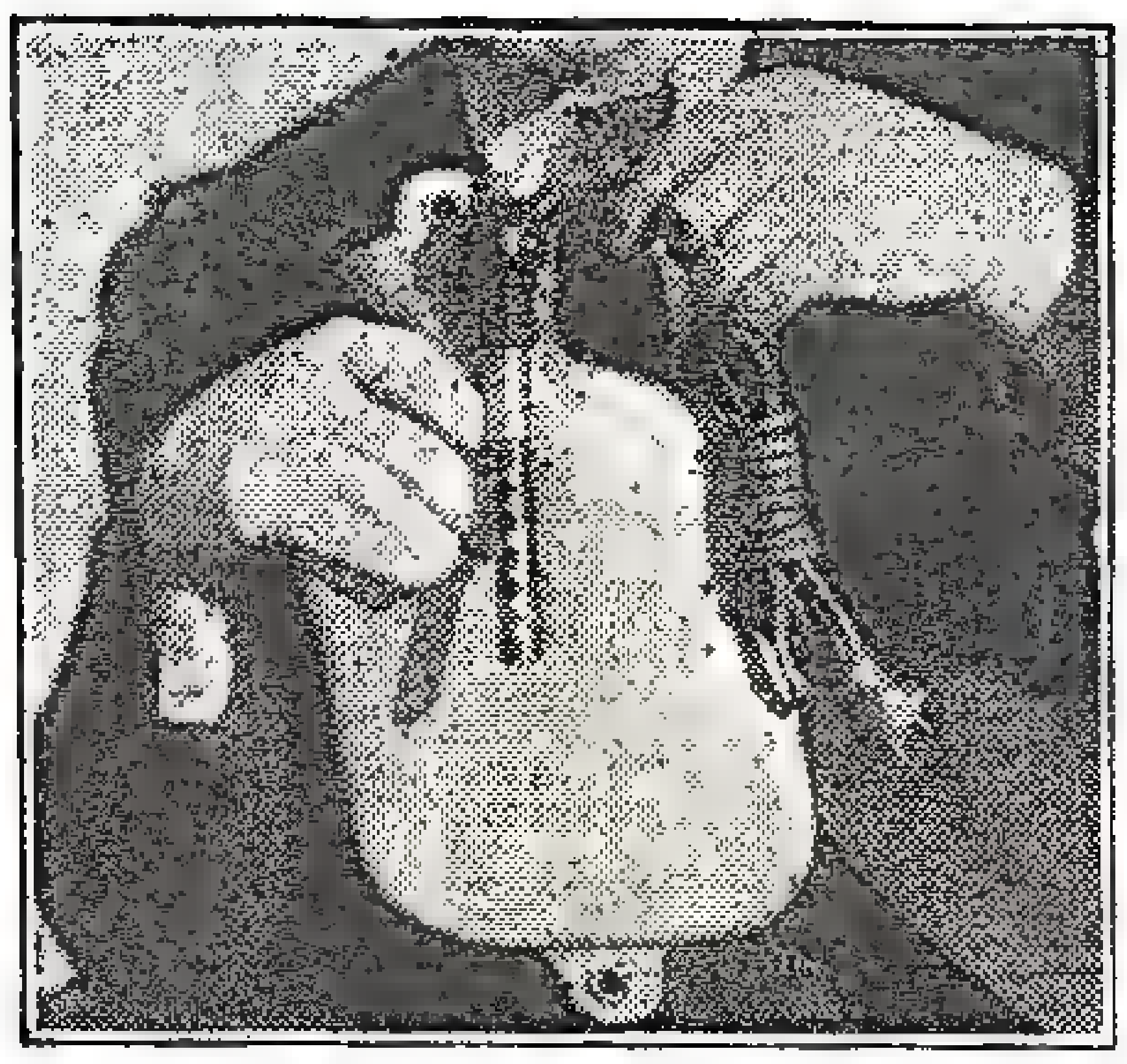
A soft water unit, containing a special granular material, removes all hardness, including lime and magnesia, from water. It rests on any ledge and attaches to faucet with a rubber hose.

A new plastic material with a rubber-like consistency may be moulded into any shape, and resists the action of chemicals injurious to rubber. It has greater flexing power than rubber, and will be used when resistance to strong oils and chemicals is desired.

A six inch bristle brush for varnishing is now available. Attached to a long handle, it may be operated like a push-broom from a standing position to varnish floors in a short time with little hard labor.

Bakelite tablets bearing the manufacturer's name are imbedded into the center of a cake of soap by Hungarian soap-makers to tell the user where to replenish his supply when the cake is used up.

Ant bait, a sweet, slow action poison for the extermination of ants, is delivered in an air tight container and feeds poison syrup through a wick set near the bottom.



A unique water heating unit is contained in a water-proof case, and may be slipped into a hot water bag to maintain any temperature desired, by thermostatic control.

A home repair pamphlet issued by an iron cement manufacturer contains numerous hints for iron repair work around the home and on the automobile.

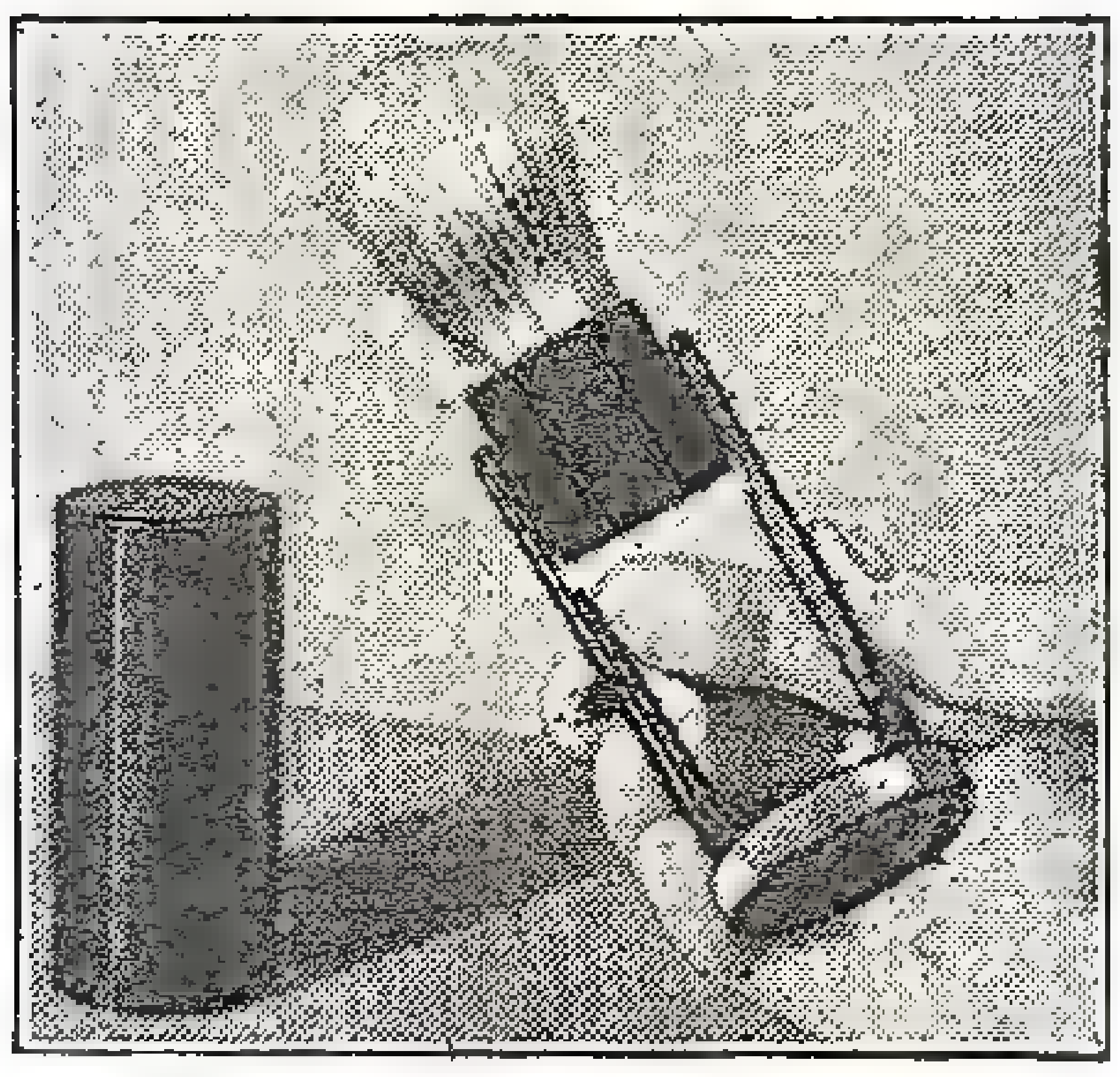
A new hack saw frame may be vertically or horizontally extended on arms so that the distance between the top of the frame and the saw-blade may be adjusted to fit the work.

A blue-print paper, recently developed, is said to provide a clear blue background without a blending of background into the white line even when over-exposed.

A radio transmitter, designed for ship and airport work, has a "frequency shift" that allows the operator to select any one of ten frequencies merely by turning a selective dial which works exactly like the conventional telephone dial.

A die-making machine, recently perfected, is said to have simple adjustments that facilitate quick changes and speed production almost one-third. The machine is powered with a one-fourth horsepower motor, takes any size saw, and uses either standard or special saws.

Electric plants, streamlined and run by gasoline motors are obtainable in six sizes to produce from 350 to 3,000 watts of flickerless alternating current. It is claimed that they will run any electrical appliance that would be used on a city line carrying wattage up to the capacity of the machine selected.



Set into a hollow handle, a self-draining shaving brush pivots into an inverted position when not in use, thereby permitting the bristles to drain. A perforated cover provides sanitary protection.

A new belt sander and grinder is designed for use on a bench, and develops belt speeds of up to 4,000 feet per minute to grind wood, metal, stone or composition materials.

A new fishing reel, said to eliminate nasty tangles when the line runs out after the bait has stopped, features a governor control which brakes the reel spool as soon as the bait hits the water. There are no visible adjustments to regulate this feature; the action is entirely automatic. The reel also has a level winding attachment to minimize snarled knotty backlashes.

Editor's Note — Addresses of manufacturers of these and other new products in this issue can be obtained by sending a stamped, self-addressed envelope to MODERN MECHANIX AND INVENTIONS. *Manufacturers are invited to submit photos and literature for this page.*

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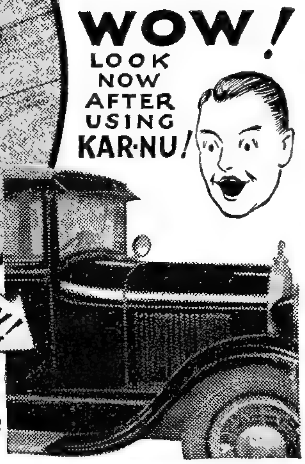
JUST WIPE IT ON!
ONCE OVER-EASY! MAKES OLD CARS LOOK NEW!


WOW! LOOK NOW AFTER USING KAR-NU!

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Lasted 8 to 12 Months GUARANTEED

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KAR-NU is entirely new and different—there is nothing in the world just like it. Now, it is no longer necessary to spend long, tedious, back-straining, muscle-tiring hours polishing, waxing and rubbing to produce a "mere shine" that is only fairly satisfactory. KAR-NU is free from the labor and danger of so-called "cleaners" with acids and abrasives that remove some of the finish each time they are used. KAR-NU produces a result that is equal in beauty to a repaint or refinishing job which costs $25.00 to $75.00. Stands blazing sunshine and engine heat, rain, snow and below zero temperatures, repeated car washings.

This Seal of Approval awarded by the Automobile Club of Illinois shows that KAR-NU is a product of merit and does all we claim for it.

Tested and approved by the Automotive Test Laboratories

OTHER USES

Besides refinishing automobiles, KAR-NU has hundreds of other uses in the home, office, factory, store and shop. It refinishes typewriters, adding machines, cash registers, scales, desks, chairs, file cabinets, furniture, book cases, safes, etc.—in fact anything made of metal on which **the original finish has** become dull or discolored.

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Enormous demand! Millions want it! W. L. Morgan, of Mass., earned $10.61 in a single hour. Sell to individuals, fleet owners, garages, auto accessory stores, used car dealers, etc. No experience necessary. Send no money for sample and details. Get in on ground floor. Just **mail coupon—NOW.**

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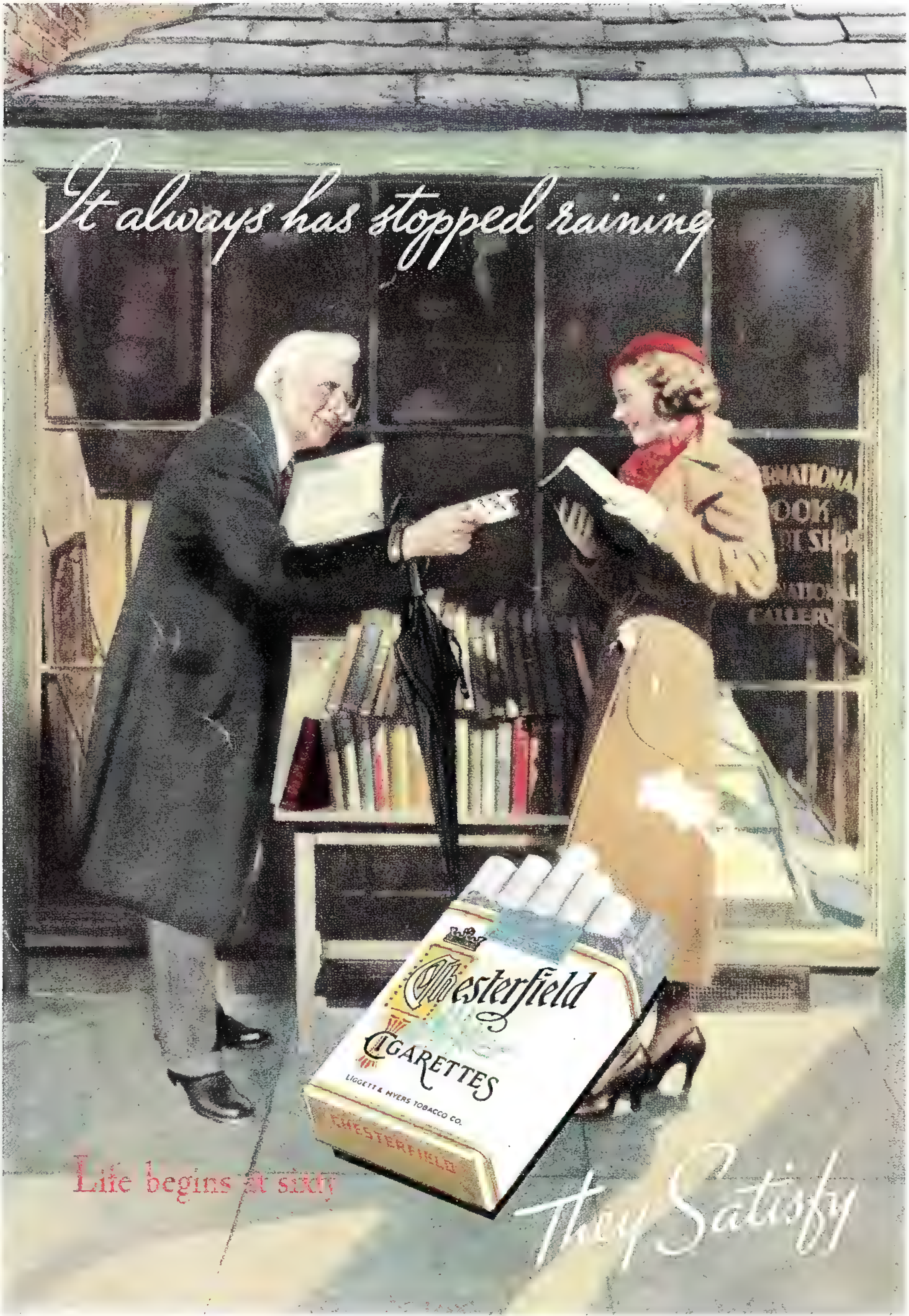
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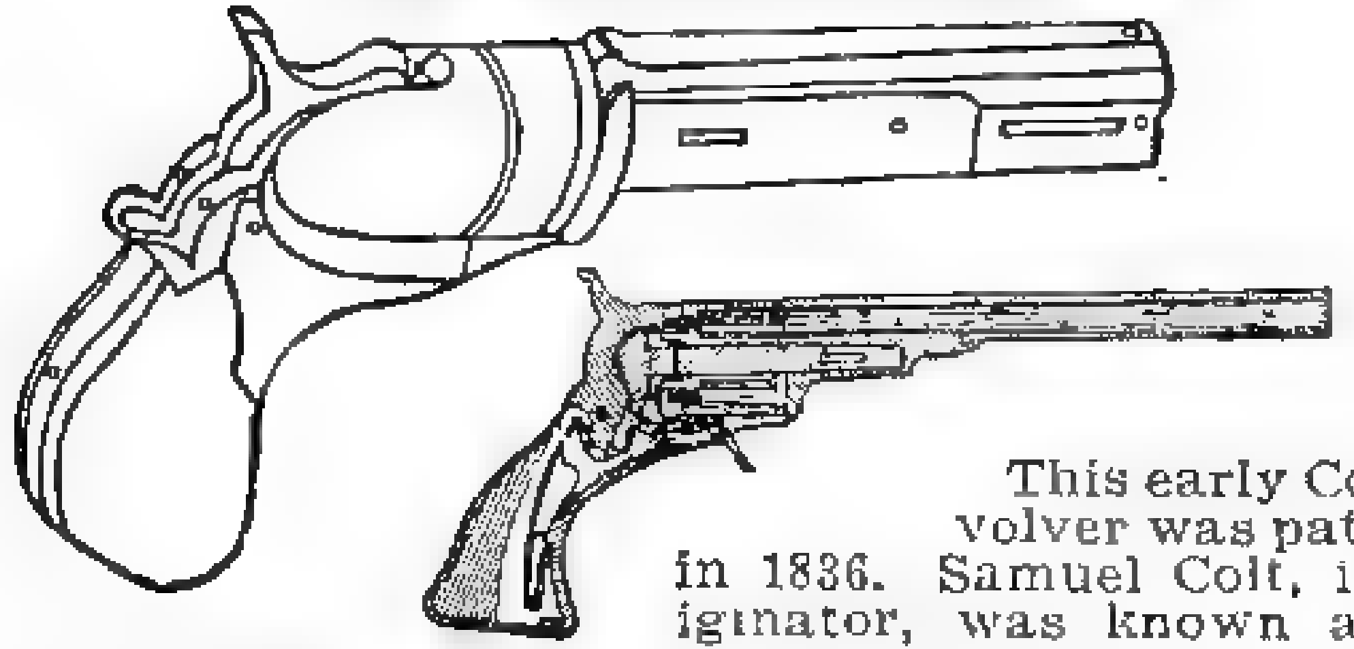
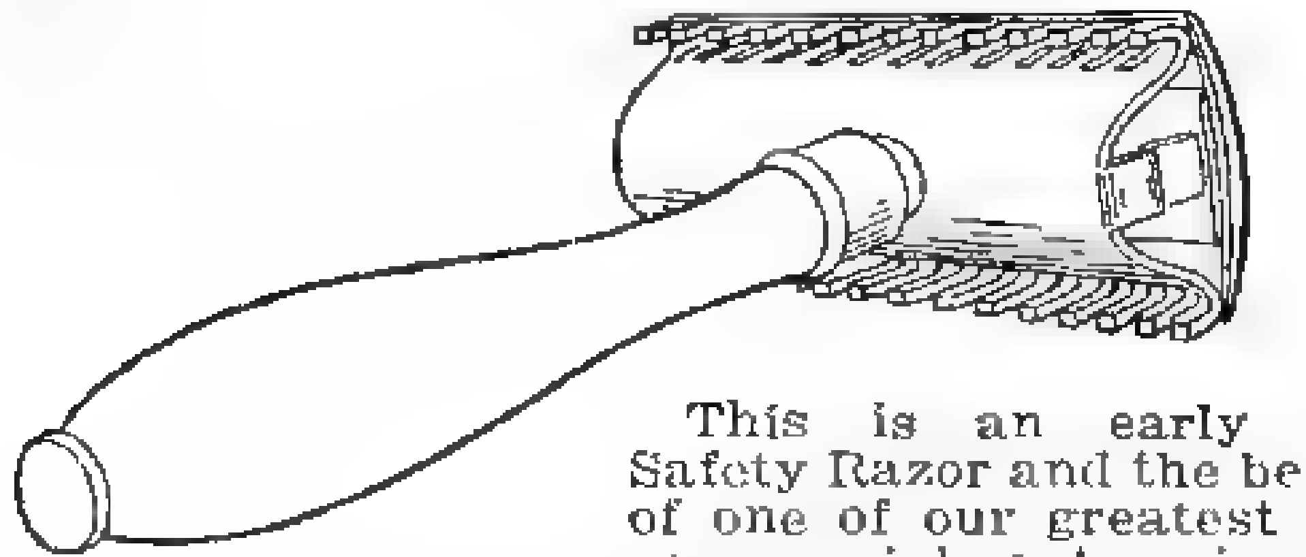
INTERESTING INVENTIONS

An Early Revolver



This early Colt revolver was patented in 1836. Samuel Colt, its originator, was known as the boy inventor. While still a lad he ran away to sea and whittled the first model of a repeating fire-arm out of wood during his leisure moments on shipboard. Colt is a good example of the inventor who was persevering. Three years later, in 1839, he had made improvements to produce the second revolver shown here. It was used in the Mexican War with excellent effect. By 1852, Colt had the largest fire-arms factory in the world. Colt died a very wealthy man.



This is an early Gillette Safety Razor and the beginning of one of our greatest modern commercial enterprises. Millions of safety razors have since been sold all over the world and millions of dollars of profit have been made. For centuries men shaved with the old straight edge razor. Then came Gillette with his happy idea.

Many Little Ideas Have Big Commercial Possibilities

Look around in any direction today and see the inventor's handiwork. Many of the most successful inventions have been the small things found in ten-cent stores, drug stores, hardware stores and the like. Many inventions have come from men who did not consider themselves inventors at all. **If you have an idea which in your judgment will make money, save money, save time, save labor or give pleasure—then see about protecting your rights to it.** It costs you nothing to learn the facts. The Patent Laws were made to protect the poor man and the rich man alike. **But you must know how to take advantage of them.**

"RECEIVED your book, 'Patent Protection'," writes an inventor, "and I am only sorry that I did not have the information contained therein some thirty years ago. **I have been unfortunate enough through my ignorance to lose out in at least three major instances where understanding would have helped immeasurably."**

Another inventor says: "In going through your book, one of your mechanical movements gave me an idea that I am sure I will be able to use in my invention."

We cite these statements from inventors simply to emphasize one point: **Ignorance is dangerous, where Patent matters are concerned.** The easiest way for an inventor to lose his rights, his possible profits, is to do nothing simply because he doesn't know WHAT TO DO.

That is why inventors by the hundred have welcomed the book shown on the opposite page. It tells them WHAT TO DO. Its facts are valuable, often vital They may be the means of saving money, saving time, and most important, saving later disappointment.

Can You Answer These Questions?

How the Patent Laws protect an inventor? What is the first simple step to take to establish a claim to an invention? What kind of a sketch or drawing is needed? When is a model needed? What can an inventor do to secure financial assistance? Why a Patent is necessary? What can be Patented? What a competent Patent Attorney can do for you? What will it cost? What is the preliminary search and why it is important?

These and other questions are answered in our 48-page book of facts, "Patent Protection." In it, we have tried to put the practical, usable information which from thirty-six years' experience we know the average man requires. Among other things it shows interesting inventions, 115 mechanical movements, views of the U. S. Patent Office, and much more. **It is yours for the asking. We gladly send it with our compliments to serious, interested men.**

HOW WE HELP INVENTORS

For thirty-six years—more than a third of a century—it has been our business to help inventors; to assist them in securing ALL THE PROTECTION TO WHICH THEY ARE ENTITLED. We have represented not a few inventors, or a few hundred, but THOUSANDS of them in their dealings with the U. S. Patent Office.

We answer questions—thousands of them a year. We study each device to bring out its best Patentable possibilities; we often dissuade inventors who might have gone ahead with inventions which could not possibly have been protected. **By methods of efficiency, carefully developed over a long period, we endeavor to keep expense at a minimum. We arrange deferred payments where they are needed.**

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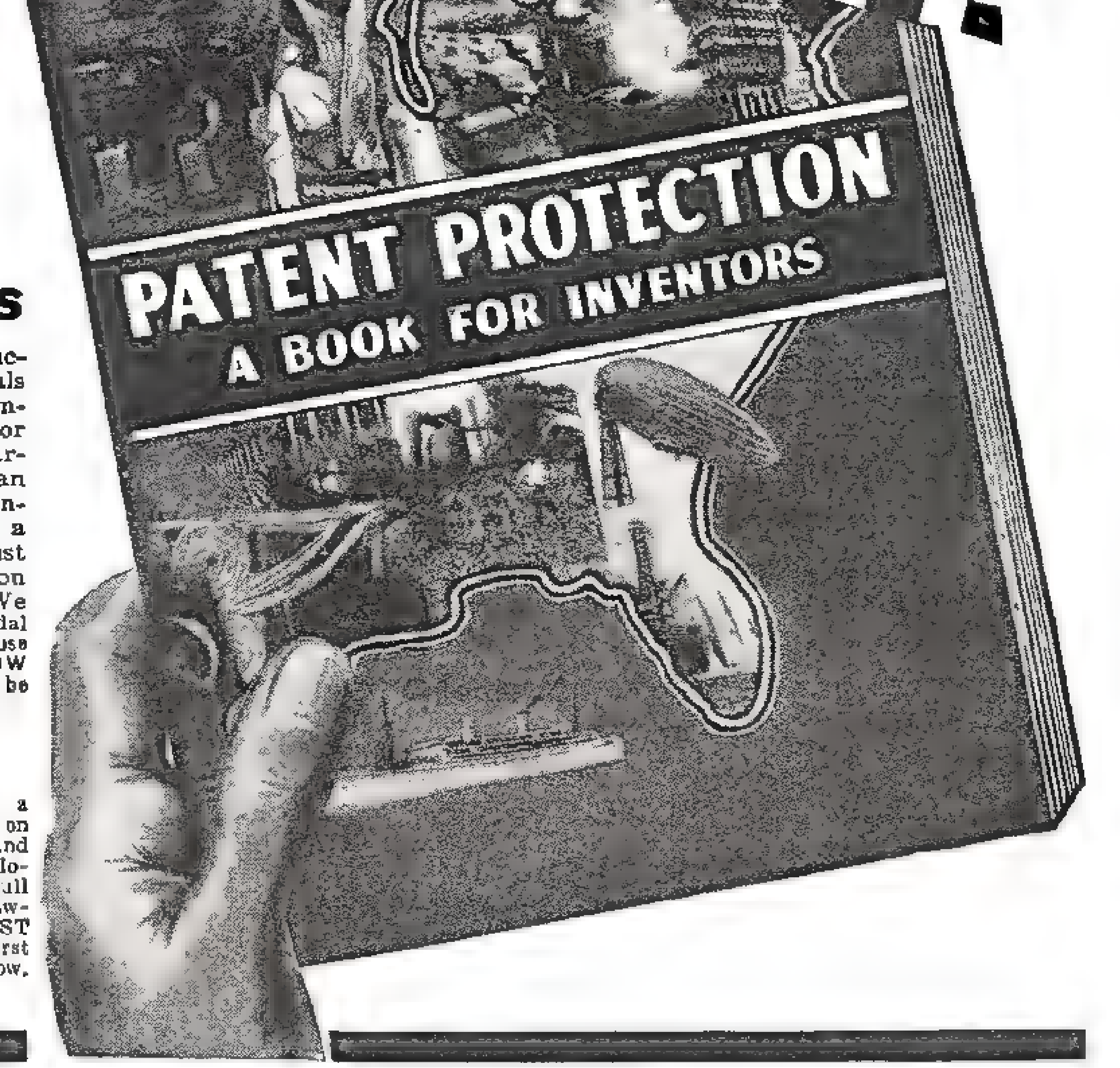
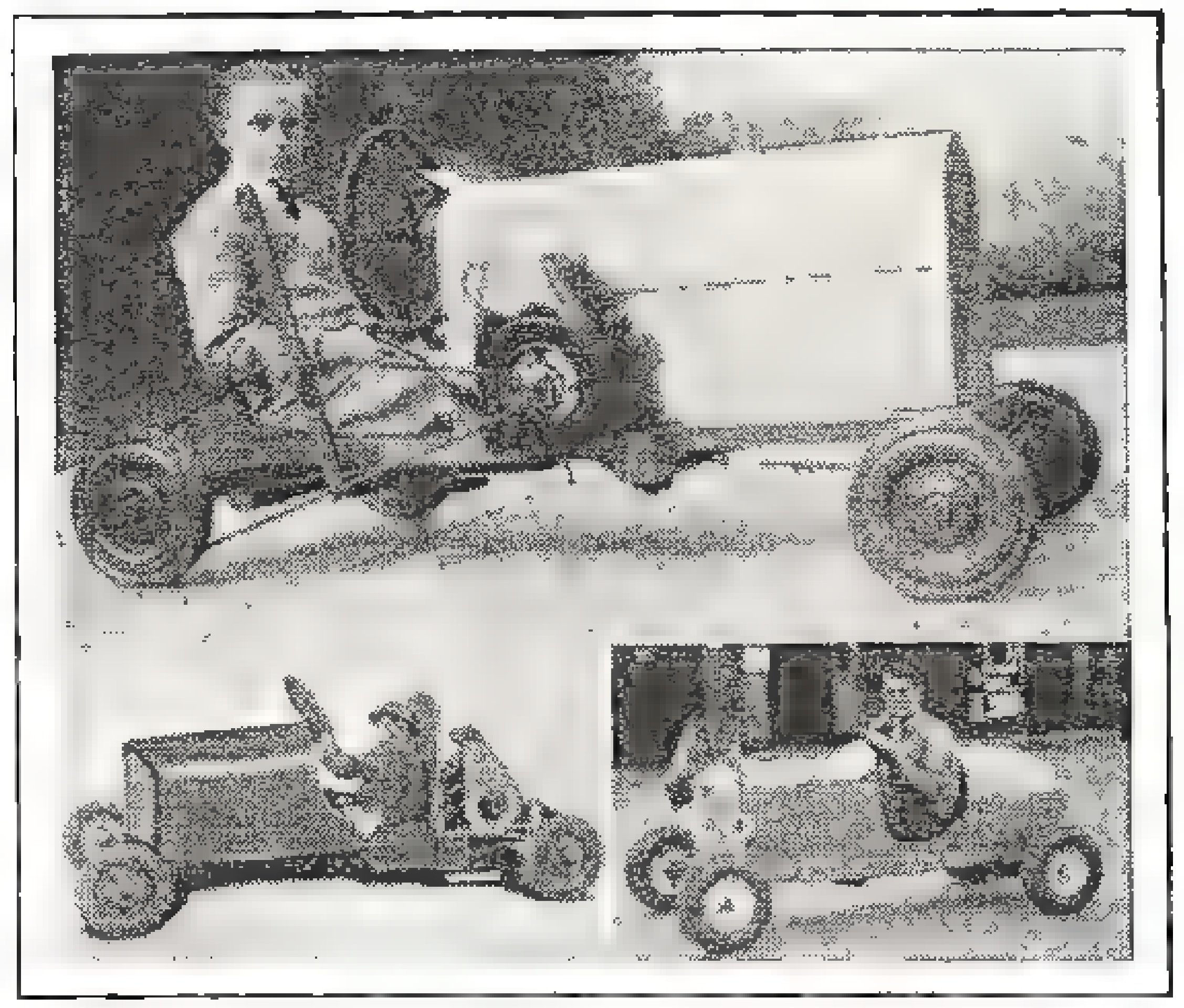
With these two booklets we will also send you a **FREE** copy of our "Evidence of Invention" form, on which you can sketch and describe your invention and establish a date of disclosure. Such a dated disclosure may later prove important to you. We send full instructions for its use. Any letters, sketches, drawings or models you send us are held in STRICTEST SECRECY. You can write us frankly. But your first step is to get the facts. Sign and send the coupon now. **Get that much done today.**



Random Chips from the Editor's Workbench

Midget car fans, boat builders, and radio hams, here's good news for you. And if you are planning an auto trailer, get inside information here on a movie star's trailer that you can build from MM.



Three types of midget cars built by MM readers. Jere McWethy, 12 years old, of Aurora, Ill., built the car at top. Jack Pinnick, 16, made a chassis of bed rails for the car at left. Ken Leiser of Madison, Wis., uses the car at right for advertising at his filling station. Jere and Jack have Briggs and Stratton motors. Ken has a one lung motorcycle engine.

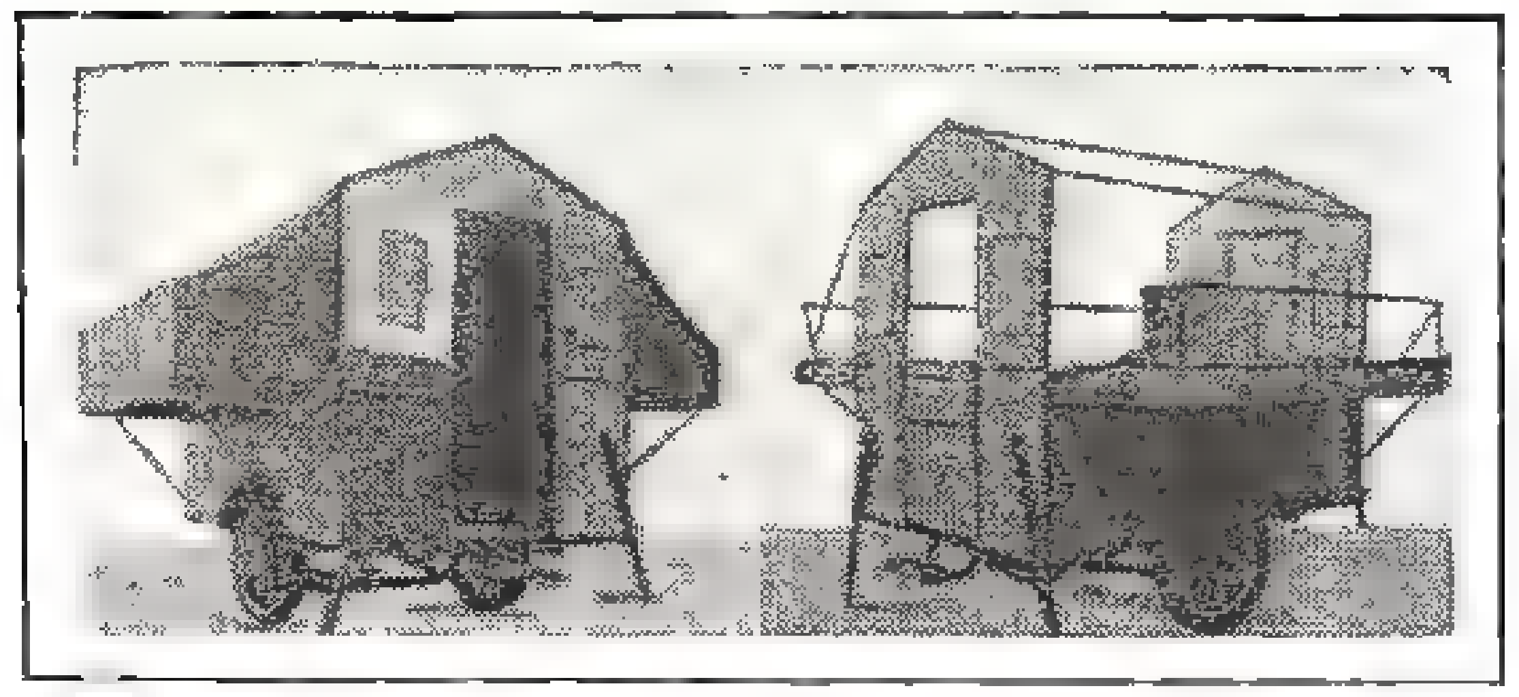
WHEN we published that excellent story in the March MM, "Television Will Carry the Mails," we overlooked granting Alfred Albelli his just credit for obtaining that instructive and revealing article from David Sarnoff, President of the Radio Corporation of America. To be fair to both Mr. Sarnoff and Mr. Albelli, our New York correspondent, the by-line on the story should have read "By David Sarnoff, President of R. C. A., as told to Alfred Albelli."

* * *

Spring may stir some persons to poetry, but it brings the home worshop fan out of hibernation.

Judging from the letters we have been receiving, he wants to build midget cars, automobile trailers, portable radios, and boats. This issue has them all except the trailer—and we'll tell you about that later.

We're not trying to sell you this issue because if you've got this far you've already bought it. But you had better get your order in now for the May MM. It will contain one of the most unusual automobile trailers you have ever seen and it comes to us right from Hollywood. We'll keep you guessing what movie star's trailer it is until next month.



J. E. Bowers took third prize with these photos of his bungalow trailer. At left trailer is ready to be occupied. Frame work without canvas roof is shown at right. Trailer folds up.

* * *

Before you build another radio set get a copy of MM's newest book, "Radio Builders' Manual." There is nothing like it on the market. It has everything—short wave sets, converters, adapters, auto radios, all-wave receivers, transmitters, and crystal sets. It's written so that anyone can build a set that will work and get distant stations. "Radio Builders' Manual" will be on the newsstands in a few days. If you want to get your order in early, send 50 cents to MODERN MECHANIX AND INVENTIONS, 529 S. Seventh St., Minneapolis.

This 15-foot boat, his first wood working project, won second prize for O. H. Ryerson, Columbus, O.

* * *

Let's get around to our prizes and letters before they get squeezed out. First prize of $5.00 for the best picture of the month goes to Harry Sapp, the first reader to send us photos of the "knee action" midget car in the September, 1934, issue of MM. He tells us:

Mt. Holly N. J.

Dear Editor:

Enclosed find photos of a power pushmobile that I have built and tested. The motor was formerly a two cylinder motor, but one of the walls became cracked so I converted it into a one lung affair.

The car was built from your September issue. Wagon wheels were used with 1½" by 3" stock. The free action in the front really helps because it keeps the frame from twisting.

It worked the first time I took it out and attained a speed of approximately 25 m.p.h. Several boys in town are building the midget and we might lay out a track and race them.

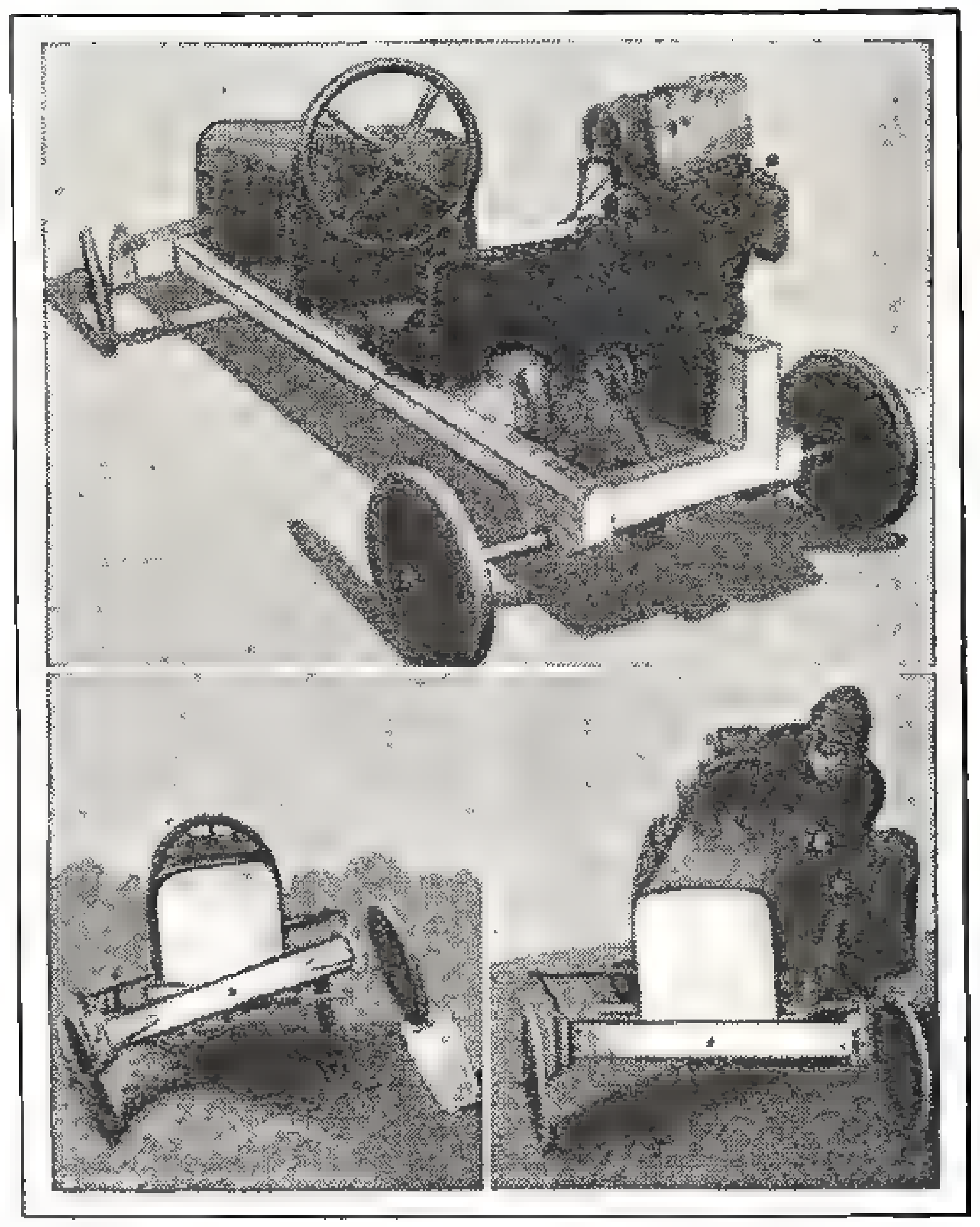
Harry Sapp.

Jack Miner, owner of a famous game farm, caught lake trout by taking Robert Page Lincoln's tips.

Twenty-five miles an hour on half an engine? Wonder what kind of speedometer Harry used? Well, he gets the five dollars anyhow.

* * *

The man who tackles a fifteen-foot boat as his first woodworking project ought to get a prize. That's why we sent a check for $3.00 as second prize to the writer of the following letter:



Construction of this "knee-action" midget car was described in the September MM. Harry Sapp built it, sent in the photos and won first prize of $5.00 in this month's contest.

Columbus, O.

Dear Editor:

Enclosed herewith is a snapshot of a Doane Hydrobout, 15½'x5'2", powered with a Star motor. The speed is approximately 27 miles per hour.

The framework is constructed entirely of inch white oak. By following Doane's con-

[*Continued on page* 22]

"REAL SHAVING COMFORT NEVER COST ME SO LITTLE!"

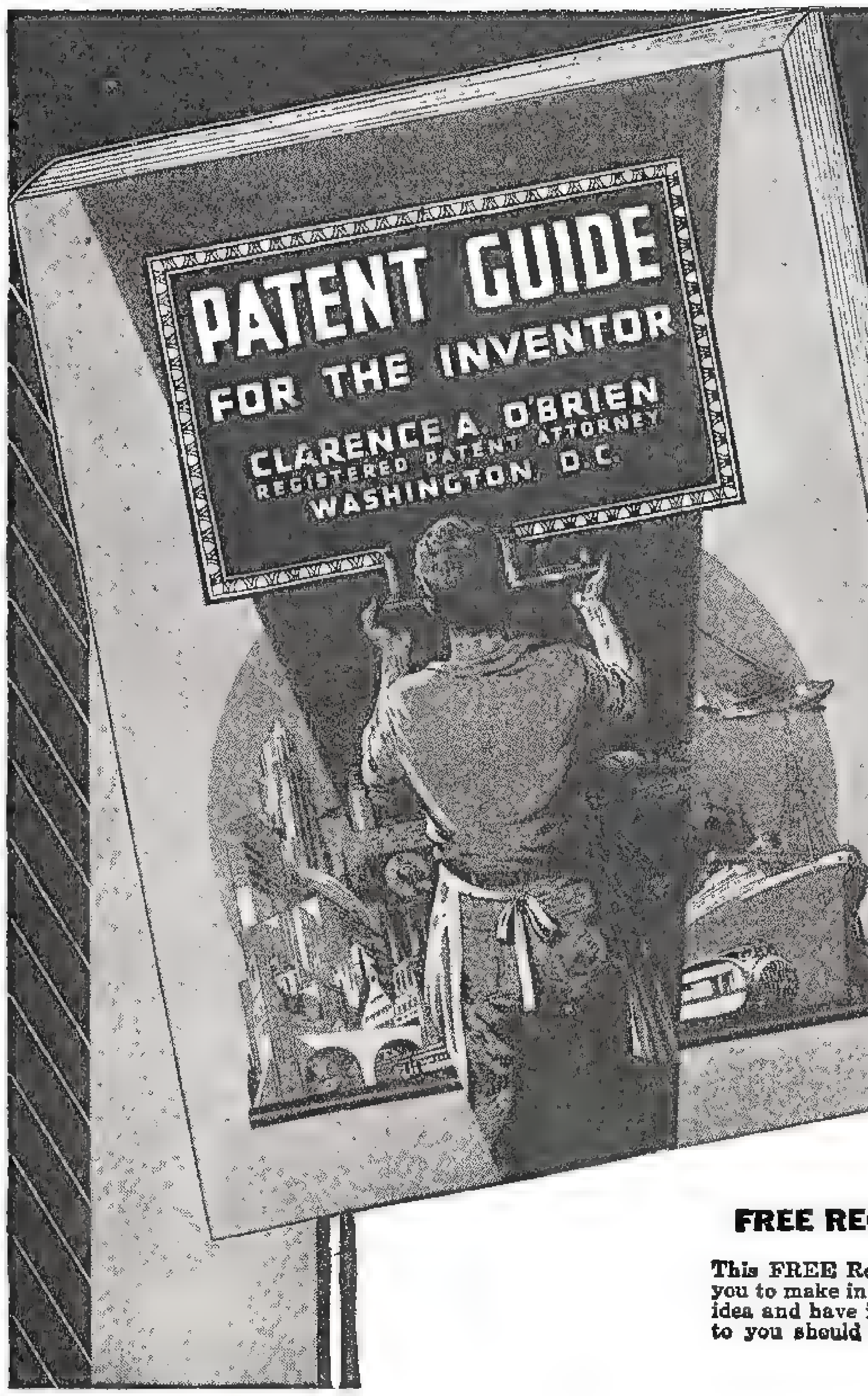
● "I never dreamed a low-priced blade could shave a tough beard like mine until I tried Probak Jr." writes T. C. Schreiber, Jr. "Now I get clean, easy shaves with never a bit of irritation and I'm saving money on razor blades."

Get the benefit of unequalled manufacturing methods—automatic tempering, grinding, honing and stropping. Enjoy real shaving comfort at lowest possible cost. Try Probak Jr.

Probak Junior is a product of Gillette and fits all Gillette and Probak razors.

NOW! PROBAK JUNIOR 4 BLADES FOR 10¢

Also packages of 10 blades for 25c and 25 blades for 59c at your dealer.



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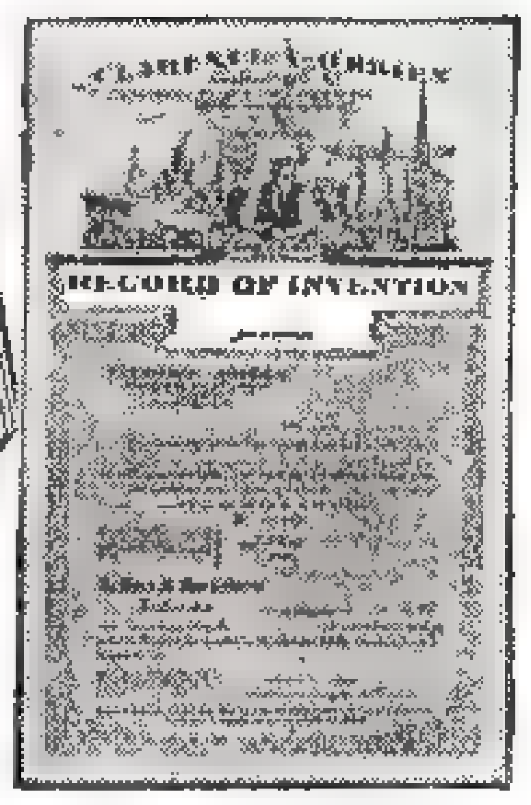

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Without a U. S. Patent, you cannot expect to reap the profits that your invention may make possible. Send at once for this book. After you get that, you'll know exactly what to do to protect yourself.

Anything you write me or send me is strictly confidential between us. All letters and drawings are kept in strong, steel, fire-proof files, which are open only to myself or authorized members of my staff. I have secured patents for inventors located in every State in the Union. The practice of my organization is confined entirely to Patents, Trade-marks and Copyrights. I have had years of experience in patent matters. When you place your idea in my hands, I am in a position to proceed at once to secure protection for you My fees are reasonable, and if you desire, I can arrange convenient terms of payment.

INVENTIVE FIELDS

Is your invention something for the home, the farm, the factory, the store? Would you like to know whether anything like it has ever been invented? You'll find scores of examples of patents reproduced in my 48-page book. You'll get a good idea of whether you "have something" or not. Would you like to know how you may judge the marketability of your invention? This book gives you several important tests prepared by authorities. Read of the experiences of Bell, Edison, Westinghouse, and other outstanding, successful inventors who patented and thereby protected their inventions.

This book not only tells you how to obtain patent, it explains the steps that must be taken afterwards to promote the success of your invention. It answers such questions as—What is an inventive improvement? What is the worth of an improvement? How should inventor arrange for manufacture? Has an unknown inventor a chance to make money? What are the qualifications of an inventor? What happens to the patent infringer? Can local attorney handle patent case? How did other inventors get started? What pitfalls should an inventor avoid? Can inventor learn whether his idea is worth patenting?

If you expect to realize profits from your invention you must protect it with a U. S. Patent. Otherwise you may find that all your time and labor have been lost, because it often happens that other inventors are working on the same idea. If you have an idea, an invention, or an ambition to invent—get the information on obtaining patent **AT ONCE!**

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Building Stratosphere Air-Liners

by
ALLAN LOCKHEED
Noted Plane Designer

This article on the strato-plane of the future tells how huge double-decked planes will speed through the rarefied air from coast to coast in six hours.

Above—Allan Lockheed, designer of Lindbergh's "Tingmissartoq," of the monoplane with which Amelia Earhart conquered the Pacific, of Wiley Post's "Winnie Mae," and other famous planes, is also the author of this comprehensive article on building stratosphere air-liners. Right—The Lockheed "Scout," designed 16 years ago, compares favorably with planes of later development—testimony to the fact that the future in aviation can be predicted today with reasonable accuracy. The streamlined principles of the "Scout" will be further developed in strato-planes.

ALLAN LOCKHEED

Supplies the nation's premier flyers—Lindbergh, Earhart, Hawks, Post, Wilkins—with Lockheed planes for their record feats. This pioneer of early aviation, now active on design work for air transports of the immediate future, contributed many of the ships that today are burning up commercial airline schedules and cutting air mail time in half. Consequently the words of Allan Lockheed, today one of the outstanding individual technicians of aviation, are of more than usual significance when he deals with the problems of flying airplanes in the stratosphere. His story follows:

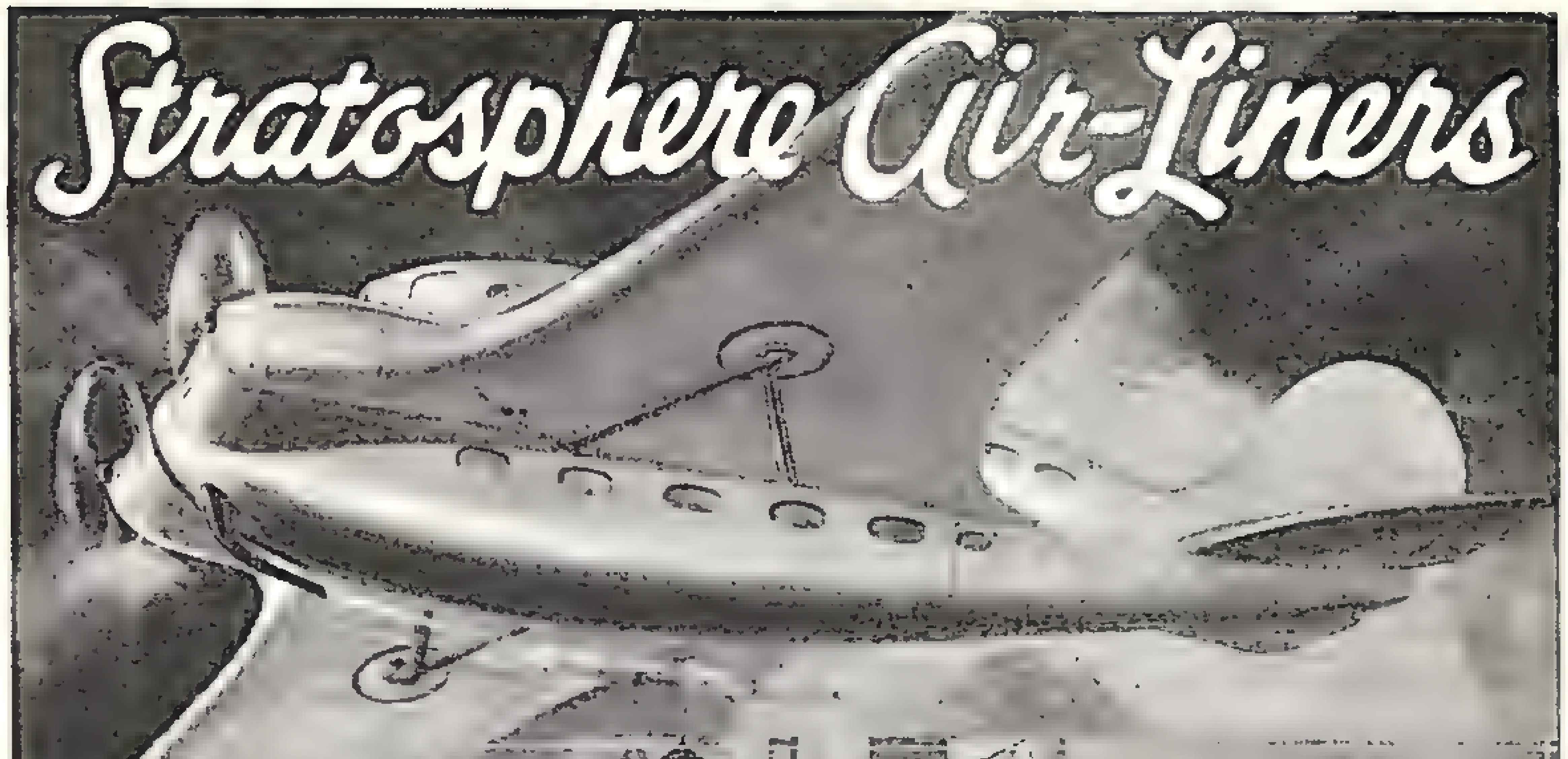
WHY fly in the stratosphere?

Simply because there's a free 200 mile an hour boost up there that aeronautical engineers want to take advantage of. If one could plan a railway that would run down hill all the way from coast to coast, think of the transcontinental speeds he could attain.

Flying in the stratosphere is not as simple as building a downhill railway, but it is a subject which has intrigued airplane designers for a long time. Much data has been accumulated about it. Many rumors have seeped through the daily press about the wonderful trans-oceanic speeds we are going to get. All that is in the offing.

Right this minute, however, enough material has been accumulated through pioneer experiments and flights to turn the minds of those of us who are engaged in the business of developing airplanes toward the possibility of building a stratosphere plane today. Under existing conditions, with existing materials, we plan to double our present speed by the simple expedient of welding this 200 mile an hour stratosphere boost to our cause.

Up in the stratosphere—that layer of air between 50,000 and 75,000 feet altitude—there are steady winds that blow from West to East, opposite the direction of the earth's rotation. By these winds alone we can gain a measureable increase in our overland speed. But there is another factor. As we ascend, the density of the air becomes less and less. This eventually diminishes to a point where we have gained the effect of reducing our fuselage and wing drag; which is the same as saying we have reduced our wing surface to the minimum. At the same time, through supercharging or forcing air into the carburetor to increase performance, we have maintained our motor power output. The result is naturally a big jump in speed.



Above—A double-decked passenger plane following Lockheed's design for stratosphere air-liners. Note the "in-line" type motors faired into the wings, the retractable landing gears, and the wings set in the middle of ship. Right—At work on the Jimmy Martin strato-plane at Bucks, England. The plane may be completely taken apart for shipping. The motor was built at a cost of $200,000, and attains a speed of about 400 miles per hour.

The only justification for stratosphere flight is velocity. If two points are so close together that an airplane could reach one point from another in less time than it would take to climb into the stratosphere, go the distance and descend, there will be no need for stratosphere lines. But the coast-to-coast route is a logical objective! Volume of traffic in paying quantities and the great time to be saved create a demand for such service.

Since the eastern trip will take about 6 hours under top conditions, probably the airline men will loaf from Los Angeles to New York, taking 8 hours. Then by speeding the ship up against headwinds, they can maintain the same schedule going west to the coast. Here it will be a matter of psychology in balancing public feeling so that the traffic will be as heavy one way as the other.

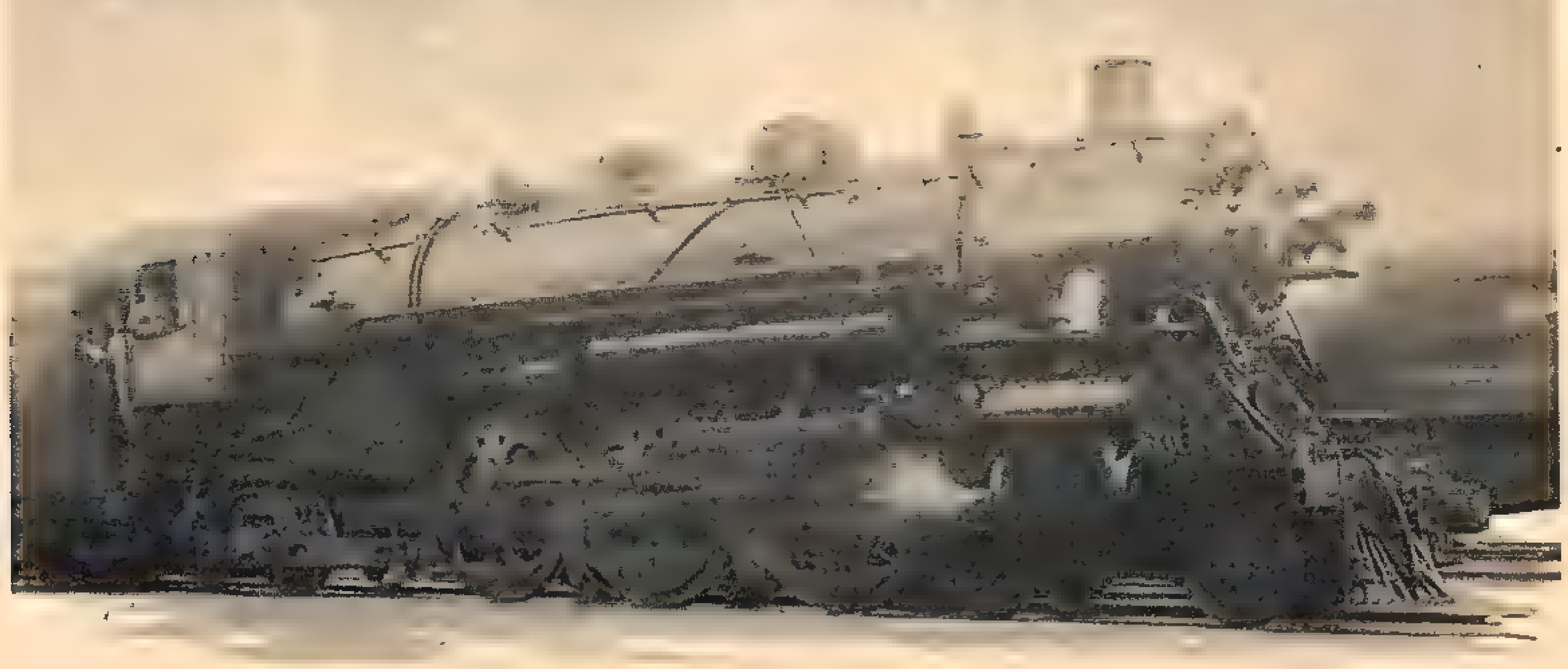
But I'm getting a bit ahead of myself. I talk just as though the stratosphere airliner were an accomplished fact. To me it is—I've carried all the probabilities around in my mind's eye until I can recite them backwards. Cleopatra could have had an automobile, you know. At that time all the materials existed which were necessary for the construction of the car. We can have a stratosphere plane if we want it; and we know how to build it and what it will look like.

I'll tell you what the plane will look like, and why it will be constructed the way it will.

Confidence in this prediction is based on the fact that my early ideas have stood the test of time. Some of the designs I did ten and twelve years ago, radical at the time, can

American RAILROADS Challenge SPEED Records

by
JAMES DYSON



This giant oil-burning locomotive has made Northwestern railroad's new train, *The 400*, the fastest in the country. Note the large, heavily-weighted drive wheels. *The 400* hit a top speed of 91 m.p.h. on its first trip and made 81 miles in 67 minutes on the Chicago-Minneapolis run. Boiler pressure was increased on locomotive and oil fuel used to eliminate coaling stops.

THREATENED by the increasing competition of air lines and busses, the nation's railroads are whittling time schedules, smashing speed records to maintain their position at the top of transportation systems.

First established train to set up a new mark was *The 400*, fastest scheduled train on the American continent. Curiously, *The 400* is not streamlined, lightweight, or Diesel-electric, but a conventional, oil-burning iron horse. Pride of the Chicago & Northwestern railroad, it speeds over the 410 miles of re-ballasted roadbed between Chicago and St. Paul with standard coaches in 420 minutes, one hour, twelve minutes faster than old schedules.

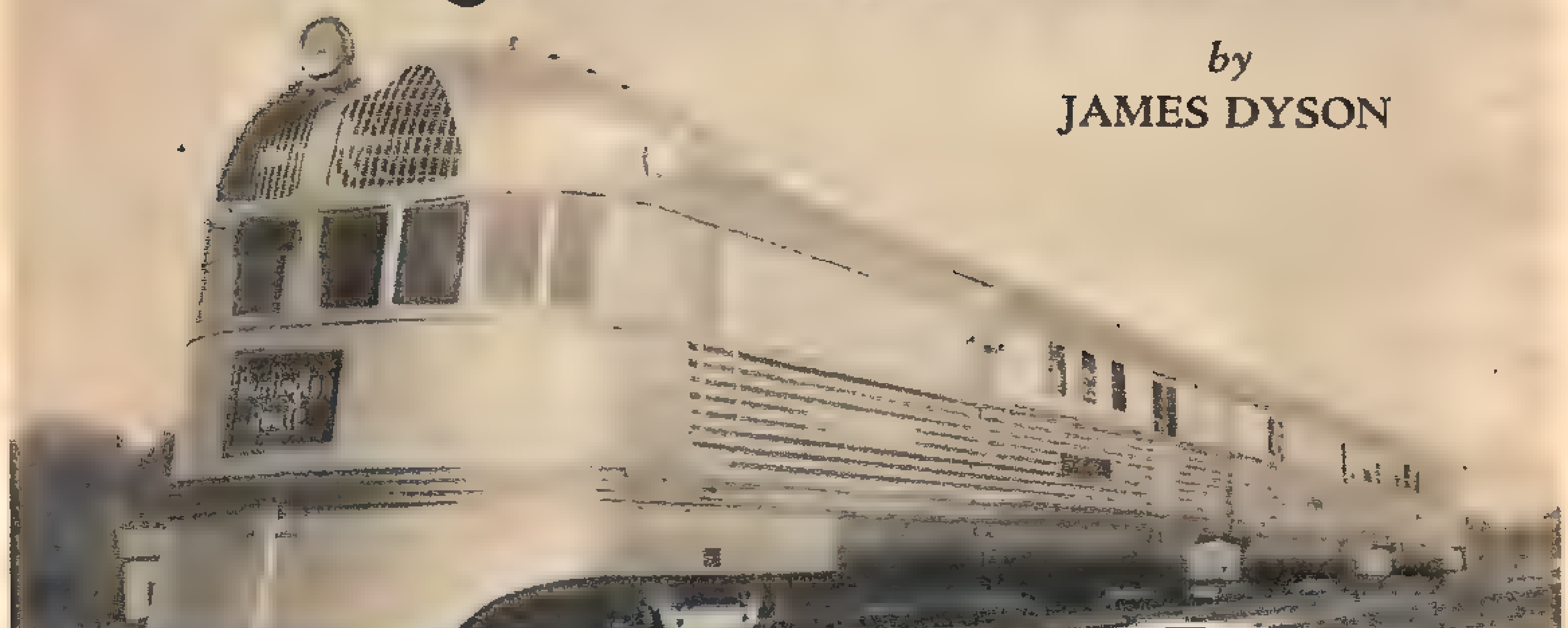
Its average speed of 58.8 miles an hour is faster than *Twentieth Century's* 54.1 m.p.h. or the Burlington's Diesel-electric *Zephyr's* 49.5 m.p.h. The new, oil-burning locomotive of *The 400* features larger drive wheels, 79 inches in diameter compared to 75 inches on similar Northwestern locomotives. As a result *The 400* makes the run between Chicago and the Twin Cities with 5,557 less revolutions of its drive wheels.

This latest streamlined train will run in New England. The Flying Yankee did better than 100 m.p.h. on a test run.

That run between Chicago and St. Paul and Minneapolis is the scene of a speed duel between three railroads, the Northwestern, the Chicago, Burlington & Quincy R. R., and the Chicago, Milwaukee, St. Paul & Pacific R. R. First to meet the challenge of *The 400* was the Burlington with two streamline trains similar to the *Zephyr*, which is now employed on a scheduled run between Kansas City and Omaha. These new, 3-car Diesel-electric units will clip at least 30 minutes off the seven and a half-hour schedule of *The 400*, according to plans.

The Milwaukee will also speed up its schedule with two new streamlined oil-burning engines pulling streamlined coaches. They are expected to have a top speed of approximately 100 miles an hour.

Throughout the country similar speed races are in the offing. Union Pacific has inaugurated a 3½ hour schedule over the 187 miles between Kansas City, Mo., and Salina, Kan., with its three-car streamlined *M-10000*. The time reduced old schedules by one-third.



The Burlington railroad's Zephyr can reach a top speed of 120 m. p. h. Two similar streamlined trains are expected to reduce *The 400's* time on the Minneapolis-Chicago run.

Santa Fe must meet this increased speed on the 67 miles from Topeka to Kansas City, which *M-10000* makes in 72 minutes. Santa Fe, it is said, plans to reduce this time by two minutes.

This western speed battle probably will extend to the Pacific coast this summer when the Union Pacific puts longer streamline trains in operation. The U. P. hopes to cut the present 54½-hour schedule between Chicago and the coast to about 35½ hours.

Winton Engine Corp, a division of General Motors, is building a new double unit Diesel locomotive for Santa Fe. The new locomotive can be driven from either end, will be powered with four 900-horsepower engines, and will have a top speed of more than 100 m.p.h. With the new locomotive Santa Fe's crack train, the *Chief*, is expected to make the 2,364 miles between Chicago and Los Angeles in 40 hours, instead of the present 55 hours.

In the East new streamlined electric engines of the Pennsylvania Railroad are cutting schedules between New York and Washington. Competing with the Pennsylvania, the Reading railroad has built a coal-burning, partly streamlined, steam locomotive that clipped off 90 miles in 88 minutes.

A new, streamlined, all-steel passenger train has been built for the Boston & Maine and Maine Central railroad. It attained a speed of more than 100 m.p.h. on a test run between Trenton, N. J., and Philadelphia, Pa.

This Union Pacific streamlined train broke the trans-continental record. U. P. now plans to increase its new trains to 11 cars pulled by two Diesel engines of 1,200 and 900 h. p. respectively. The record breaking train above has three cars.

This coach will be used on the Milwaukee's new streamlined trains between Chicago and Minneapolis. New oil-burning streamlined engines will have a top speed of 100 m. p. h. "Badger tail" car above will be used on rear of new train.

Extra Paper!

Reader buys the "extra" from newsboy without realizing how fast news is gathered.

Racing Time for News Scoops

by

ROBERT L. FREY
Executive Assistant
United Press Associations

NEWS travels fast. It circles the globe like lightning while historic events are still in the making.

The world was reading the tragic details of the *Morro Castle* disaster while her passengers were still leaping from the burning decks of the doomed Ward Liner into the storm-swept waters of the Atlantic.

Less than 20 minutes after first radio operator Rogers sent his SOS from the *Morro Castle,* the tragic story was flashed over United Press leased wires into newspaper offices from coast to coast. Cables carried it to Europe, South America and the Orient.

Rogers' signal was sent at 4:23 a. m. Picked up by the marine radio division of the Radio Corporation of America, it was relayed by telephone to the United Press. Amid the rattling battery of automatic telegraph printers in the New York office, the night editor took the message. He jumped from the telephone, shouted "Flash." Instantly a deathly silence swept the room.

Loudly but clearly he shouted the sentence to the waiting telegraph printer operators that would mean extra editions and streamer headlines to newspapers throughout the world:

FLASH
NEW YORK — RCA PICKS UP SOS FROM PASSENGER LINER MORRO CASTLE
UPA NX RM442A

The message completed, each operator rang

Flash!

```
FLASH
    NEW YORK--RCA PICKS UP SOS FROM PASSENGER LINER MORRO CASTLE
    UPA NX RM442A
```

```
BULLETIN
    NEW YORK, SEPT. 8.-- UP --THE PASSENGER LINER MORRO CASTLE,
AFIRE OFF THE NEW JERSEY COAST, FLASHED AN S.O.S., RECEIVED
HERE BY RADIO MARINE.
                                   MORE RM445A
```

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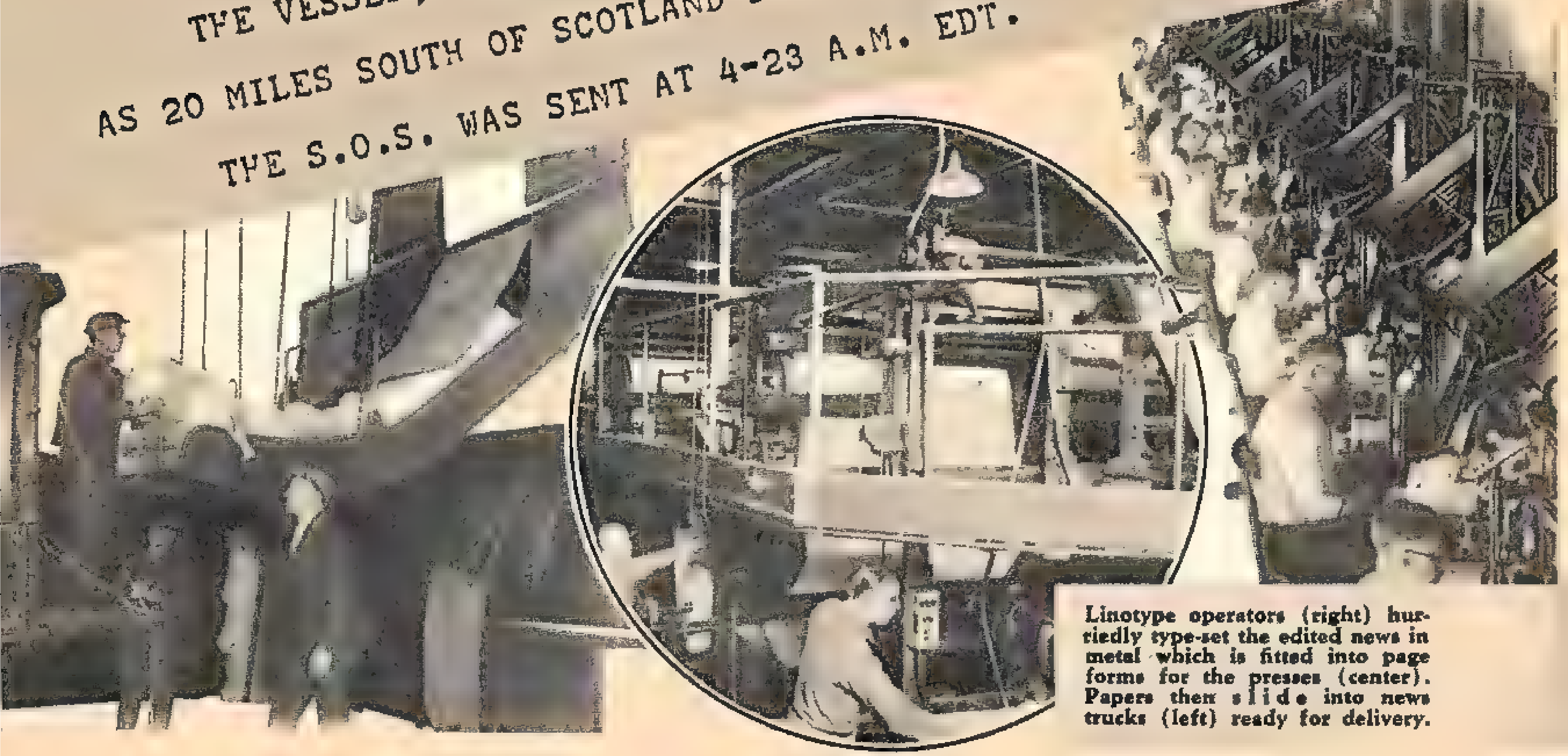
BULLETIN
    ADD MORRO CASTLE--NEW YORK X X X MARINE.
  THE VESSEL, DUE HERE AT 10 A.M., TODAY, GAVE ITS POSITION
AS 20 MILES SOUTH OF SCOTLAND LIGHT.
  THE S.O.S. WAS SENT AT 4-23 A.M. EDT.
                                   MORE RM448A
```

At 4:23 a. m. Morro Castle radio operator sent SOS. While passengers were leaping into sea (arrows in top photo), U. P. at 4:42 a. m. sent flash, then bulletin, then "add" (on opposite page) exactly as reproduced here for extra papers.



Linotype operators (right) hurriedly type-set the edited news in metal which is fitted into page forms for the presses (center). Papers then slide into news trucks (left) ready for delivery.

A section of the New York bureau of the United Press, nerve center of the association. Men at left are operators sending news over wires. Arrow shows sending tape. Man at long table in center is filing editor who decides which stories shall move first. In background center are copy editors. At right at typewriter is rewrite man.

Bureaus FLASH Photos Across U. S. by Wire

Reporters writing running story of Bruno Hauptmann (arrow above) murder trial give "takes" to messenger boys who rush to telegraph operators (below) in another room. They send it in Morse code to New York for the press association wires.

the bell on his machine ten times. On every receiving machine in newspapers throughout the land a similar bell rang ten times. Again silence while the night editor hurriedly wrote the three line bulletin subflash of the first story of the disaster.

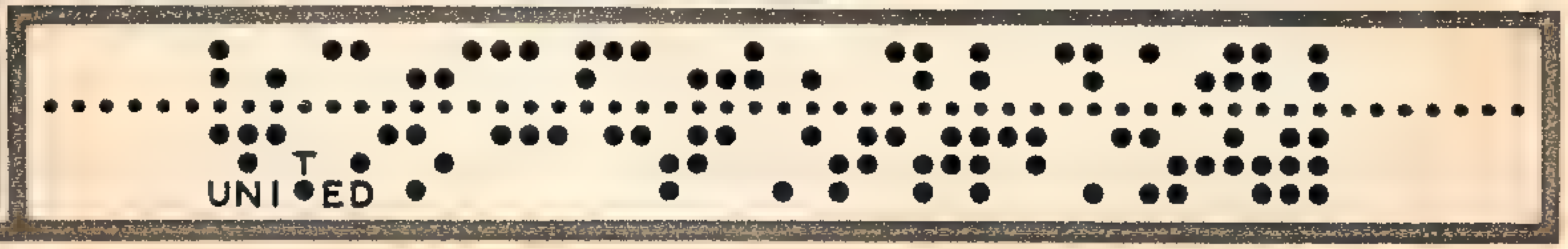
While he was still writing his assistant had grabbed hat and coat and quickly left for Asbury Park, N. J., where the flaming vessel had been sighted eight miles off shore. Between snatches of the story relayed by telephone from R. C. A., the editor put through hurried phone calls, aroused United Press editors, reporters, and correspondents and ordered them to stations along the New Jersey coast to pick up every smattering of the story possible.

Reporters phoned New York from a dozen points—calling in disconnected details of the tragedy, stories from the survivors, condition of rescued passengers and crew, rescues by the Coast Guard and Jersey fishermen. Reporters went to sea, flew in planes, interviewed every one who had the slightest information about the tragedy, patiently listed every rescue and death to bring to the world the tragic story of fire at sea. The hastily assembled editors in the New York office of the United Press in turn gathered the disconnected material by telephone and telegraph and rewrote it into the coherent stories you read in your daily newspapers.

Above automatic telegraph typewriter both sends and receives. As sending machine it punches out tape which passes through transmitter to send electric impulses over wires.

UNITED PRESS ASSOCIATIONS, NEW YORK.

Each vertical line of dots in sending tape below is a character, space or punctuation mark. Sent through machine, receiving newspaper would see typed words shown above.



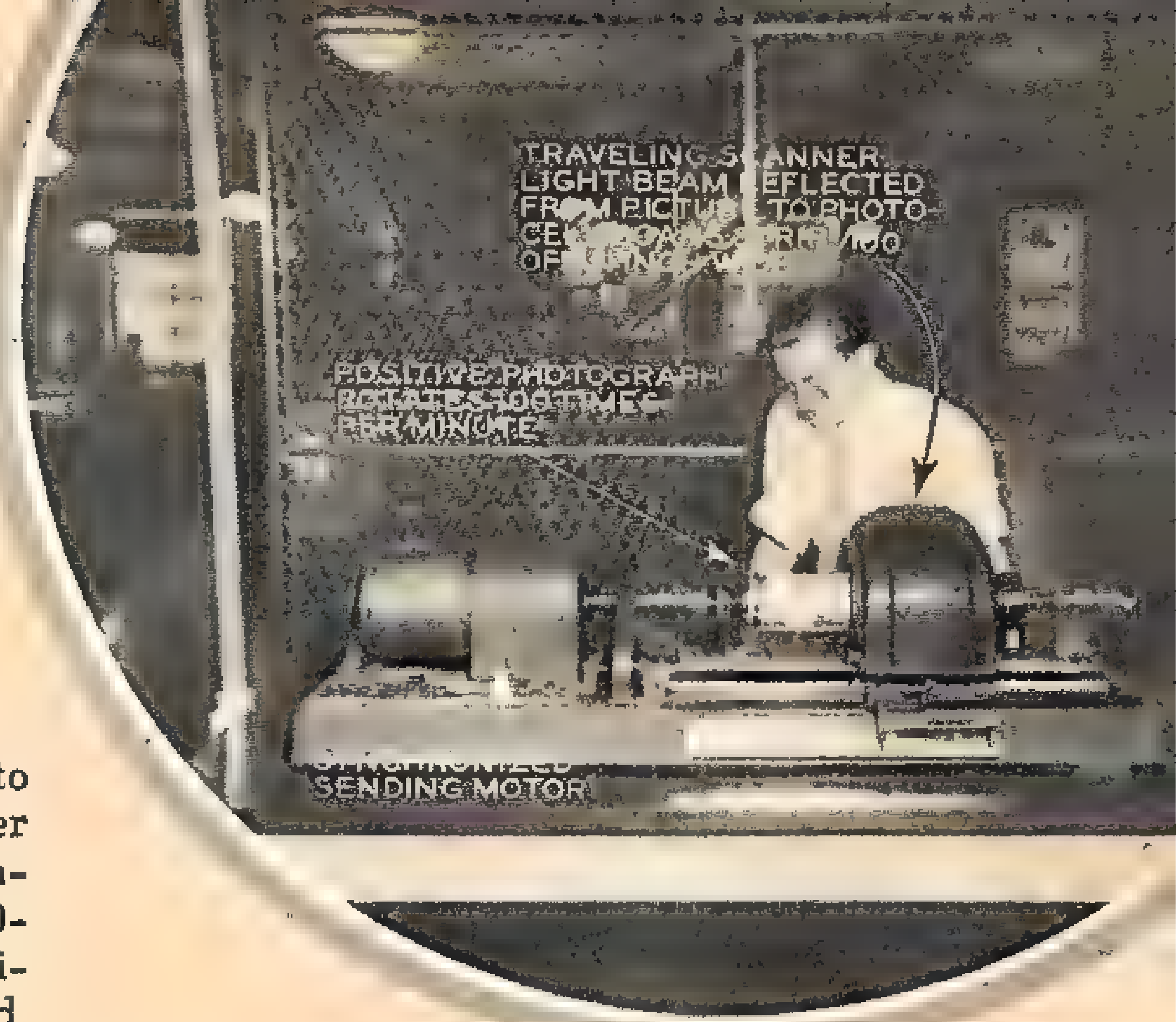
That first flash of the disaster broke into the routine news that was being sent over the United Press wires. The operator instantly broke the smooth flow of the 60-words-a-minute sending tape, used for ordinary news, switched to the direct keyboard, and punched out the flash as fast as the editor dictated it.

From that time on the story of the Morro Castle disaster, fed to the operators in short "takes," took precedence over all other news.

When Cornwallis surrendered at Yorktown, ending the Revolutionary War, it took 49 days for that news to reach England. Today such news would "flash" over United Press wires reaching 1,252 newspapers in nearly every nation of the world within 10 minutes.

Scanning headlines over their morning coffee, few newspaper readers are aware of the vast newsgathering network of telegraph wires and cables, the thousands of correspondents, laboring 'round the world and 'round the clock to bring today's news to them today.

Bruno Hauptmann testifies in the Lindbergh kidnap-murder trial, a few minutes later millions of newspaper readers know his answer to every question. A noted European statesman dies; within ten minutes the news has reached this country and a few minutes later extras are on the street telling of his death. The first flier to cross the Atlantic alone lands in Paris; within five minutes the news is in American newspaper offices and newsboys are crying "Extra!" 20 minutes later.

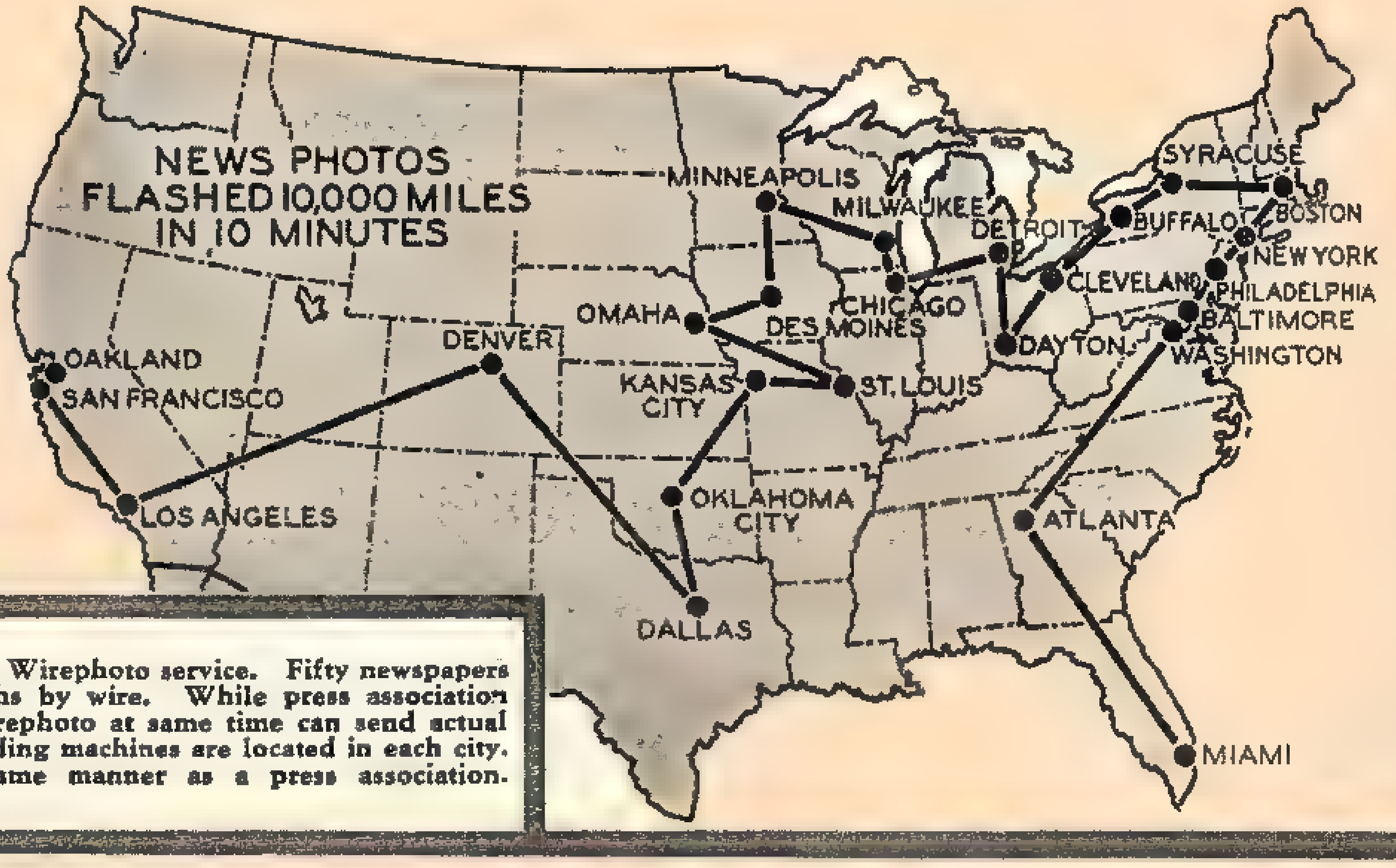

TRAVELING SCANNER
LIGHT BEAM REFLECTED FROM PICTURE TO PHOTO-CELL
POSITIVE PHOTOGRAPH ROTATES 100 TIMES PER MINUTE
SYNCHRONIZED SENDING MOTOR

To get photos in newspapers simultaneously with press association stories, Associated Press has developed Wirephoto service to send pictures by wire. Photocell scans photo, sends impulses over wire to similar receiving machine which has light-valve that acts on sensitive negative. After being developed, print is made and half-tone cut prepared for newspaper.

A press association is a world-wide news gathering agency. It supplies your local paper with all the important news that "breaks" outside of your city. The press association serves hundreds of newspapers in many countries of the world, each paper paying a fixed fee for the service.

The press association maintains key bureaus in important cities and capitals of the world which in turn control smaller bureaus

[*Continued on page* 144]



The wire route of AP's new Wirephoto service. Fifty newspapers in 24 cities get photographs by wire. While press association sends story of disaster, Wirephoto at same time can send actual photos. Receiving and sending machines are located in each city. Service is controlled in same manner as a press association.

How I Judge CHAMPIONSHIP FIGHTS

by GEN. J. V. CLINNIN

FORMER PRESIDENT
NATIONAL BOXING ASSOCIATION

Above—Gen. J. V. Clinnin, former president of the National Boxing Association, and author of this article on judging fights by point system.

ONE minute to go! Fighting men ripping and tearing at each other. . . . A figure in white moves nimbly around them. . . . The glare of floodlights. . . . A sea of faces in the darkness beyond. . . . Then—

The bell. . . . As one, the great crowd is on its feet. . . . There is a tense pause. . . . In the center of the ring, an arm is lifted in victory. . . . A chorus of hoots greets the decision. . . . The resentment grows. . . . There is pandemonium.

How many times a year do we witness this scene in the oldest and certainly the most glamorous of all sports? Too often, maybe, for the good of the game. In many places where boxing is legal, decisions that bring hoots of derision from the fans are doing incalculable injury to a fine sport.

What is wrong? Is it the system of selecting the winner? Is it the practice of naming inexperienced judges? Is it the referee? Is it because the fans are prejudiced? Let's see what is wrong and find out if there is a remedy.

Above—Baer steps inside of a right-hook to land a hard straight left to Carnera's chest. The blow was cleanly made, delivered with the fist closed, the knuckles forward—the type of punch that is a point winner both with the judges and to the most critical audience.

Above—Billy Petrolle ducks under a fast left-hook delivered by Sammy Fuller. To many in the back of the audience, this may look like a clean blow, but to the referee and judges, it is obvious that it glanced ineffectively off the back of Petrolle's head.

Left—Carnera struggles to rise, as the referee advises Baer to get into a neutral corner while the champion is still down. Using the Illinois system of scoring, Baer would score points for the knockdown, but he might lose them if he continued to disregard the referee's repeated warnings to get into a neutral corner. Failure to do this is considered as a breach of sportsmanship as it does not afford opponent a fair chance to regain his feet.

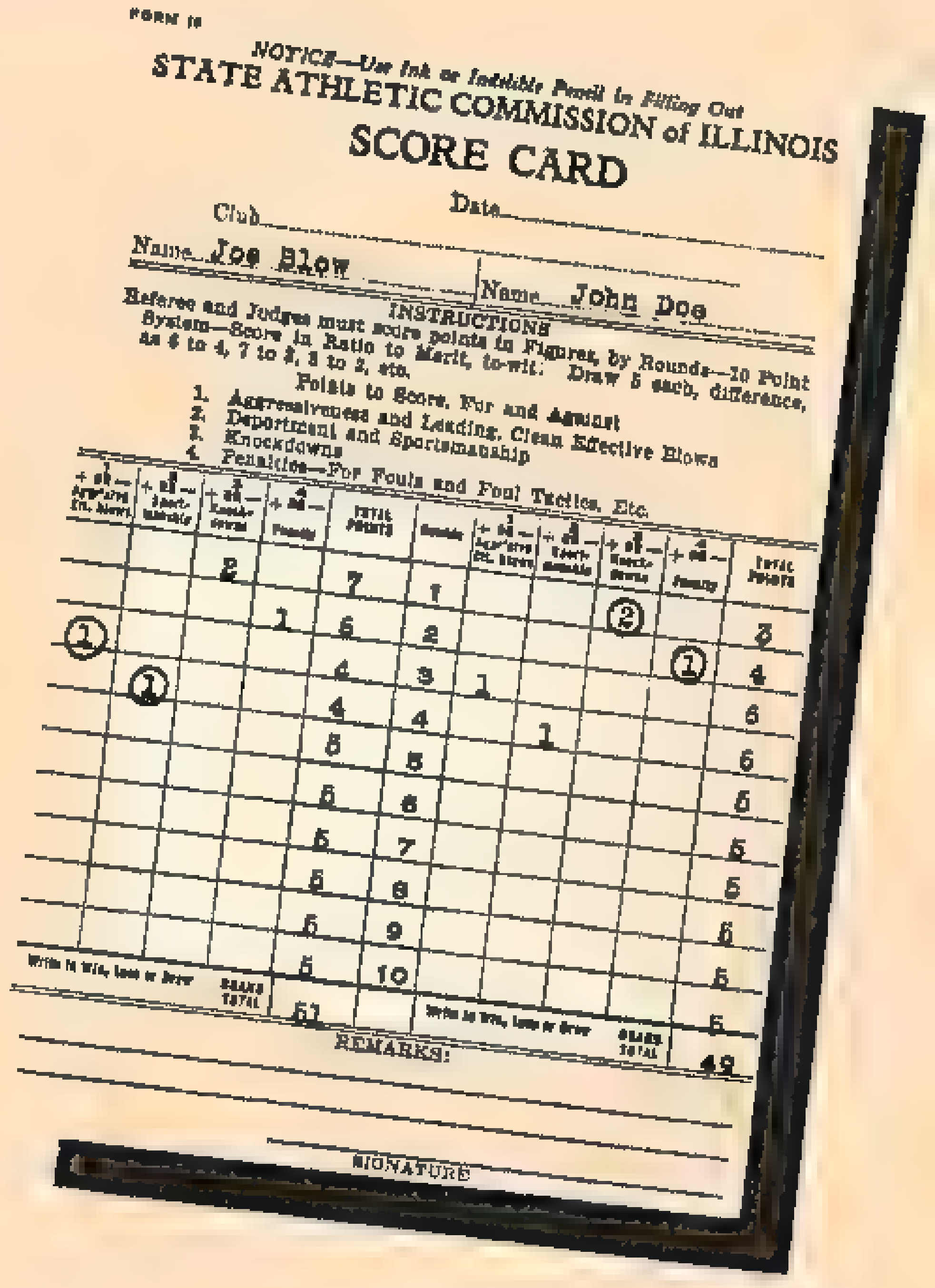
There are two major boxing centers, New York and Chicago. In New York, until recently, the system of scoring fights was solely by rounds. For some years, Chicago has employed what is the nearest approach to a perfect scoring system and New York is now experimenting with a similar plan.

In Chicago, the scoring system is one that came into vogue while I was chairman of the Illinois Boxing Commission. It was invented by Dave Barry, the referee, and William Battye, one of our most competent judges. I shall explain it briefly:

Each of the two judges and the referee is given a card on which are five columns for each boxer. The rounds represent units of ten points each; that is, five points, for each contestant in case of an even round. The columns and their classifications follow: 1. Aggressiveness, clean effective blows; 2. Deportment and sportsmanship; 3. Knockdowns; 4. Penalties—For fouls and foul tactics;

[Continued on page 120]

Below—A score of a mythical match between Joe Blow and John Doe. In the first round, Doe is penalized two points as he is knocked down. In the second, he loses a point for using a rabbit punch. He gains a point in the third for aggressiveness and one in the fourth when Blow uses abusive language to the officiating referee.



FORM 18

NOTICE—Use Ink or Indelible Pencil in Filling Out

STATE ATHLETIC COMMISSION of ILLINOIS

SCORE CARD

Club____ Date____

Name Joe Blow | Name John Doe

INSTRUCTIONS

Referee and Judges must score points in Figures, by Rounds—10 Point System—Score in Ratio to Merit, to-wit: Draw 5 each, difference, as 6 to 4, 7 to 3, 8 to 2, etc.

Points to Score, For and Against

1. Aggressiveness and Leading, Clean Effective Blows
2. Deportment and Sportsmanship
3. Knockdowns
4. Penalties—For Fouls and Foul Tactics, Etc.

		2		7	1			②		3
①			1	6	2				①	4
	①			4	3	1				6
				4	4		1			6
				5	5					5
				5	6					5
				5	7					5
				5	8					5
				5	9					5
				5	10					5
Write in Win, Lose or Draw		Grand Total		51		Write in Win, Lose or Draw		Grand Total		49

REMARKS:

SIGNATURE

ELECTRICAL CITY Built Without CHIMNEYS

Nestling on sagebrush plateau high above swift-flowing Columbia river is Mason City—a town without a chimney—world's first all-electric city! Homes of U. S. engineers can be seen on near side of river. Grand Coulee Dam is being built at this point.

by GRACE KIRKPATRICK

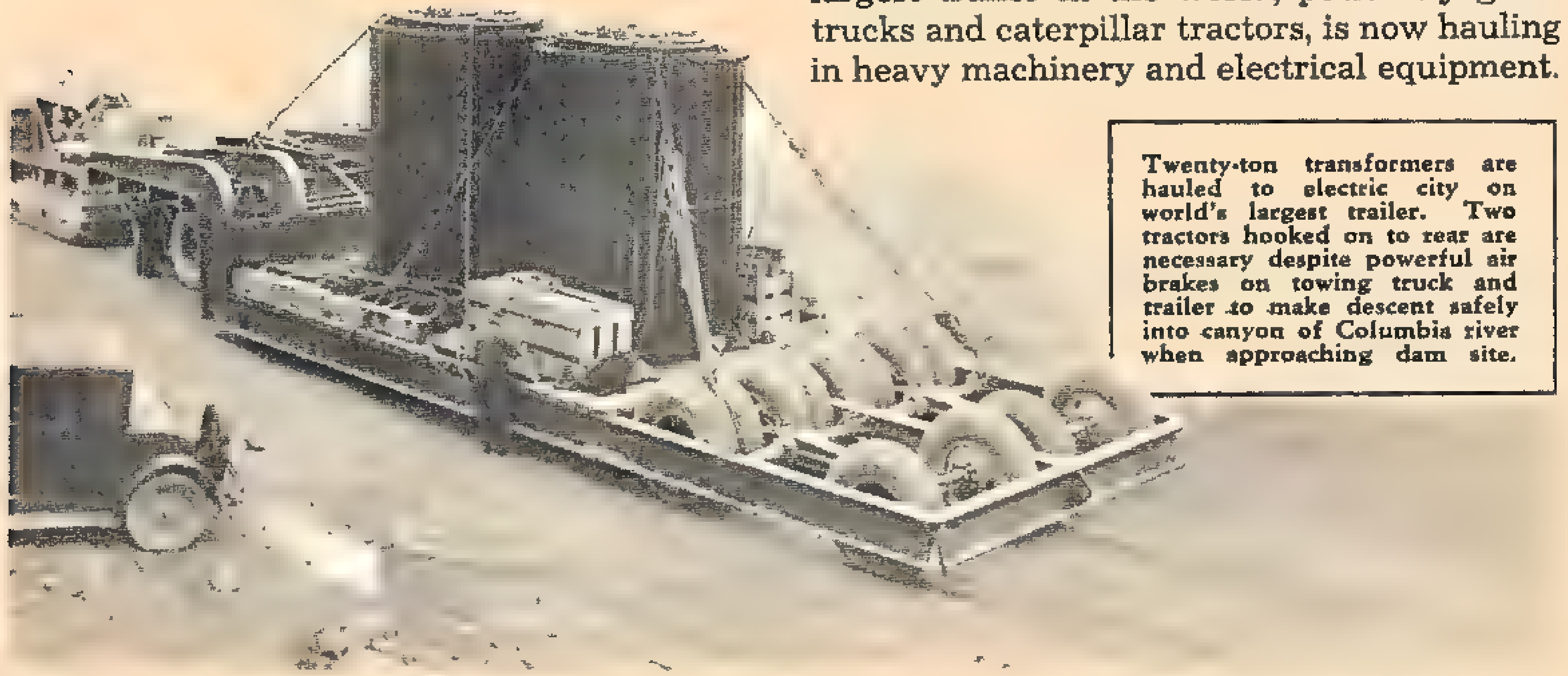
Strikingly beautiful is this night view of world's first all-electric city—town built on east bank of Columbia river for construction workers on Grand Coulee dam project. Temporary wood bridge crossing river is expected to be destroyed by spring floods.

PRESTO! This was the exclamation of wonder when, not a generation ago, electric lights flashed on as tiny buttons were pushed. The invention of the electric washer, the electric range, the electric refrigerator, and the electric heater in turn brought forth this same exclamation.

But that an entire city should "Push the button" for all these purposes—that a town which is the home of nearly five thousand people should be built without a chimney is "presto" indeed; particularly when the city has been built within two months on a high sagebrush plateau in one of the wildest and least populated districts of the far west.

Such a miracle has happened. Mason City, constructed for the families, employees and officials of the contracting firm which is building the mammoth Grand Coulee Dam on the Columbia River, 92 miles west of Spokane in central Washington, is an all-electric city—the first in the world.

The inhabitants of Mason City will construct the world's greatest dam—almost four times as long as Boulder Dam, and with twice the power capacity of the gigantic Muscle Shoals project. In the development, the largest conveyor system in the world will carry spoil dirt from electric shovels even bigger than those used on the Panama Canal; the largest trailer in the world, pulled by giant trucks and caterpillar tractors, is now hauling in heavy machinery and electrical equipment.



Twenty-ton transformers are hauled to electric city on world's largest trailer. Two tractors hooked on to rear are necessary despite powerful air brakes on towing truck and trailer to make descent safely into canyon of Columbia river when approaching dam site.

Every one of the 360 homes, as well as the business and office buildings, will be heated by electricity. Enough heating equipment is installed to keep buildings comfortable even at 29 degrees below zero, the lowest recorded temperature in the vicinity of the Grand Coulee in 22 years.

In addition to the heating units, each home has an electric range and electric refrigerator. Some of the larger homes will be equipped with complete air-conditioning plants.

The heaters used are portable, the plans calling for 1½ to 6 kilowatt units in each of the rooms. Twenty-eight thousand heaters will be needed for the first 360 houses. The cost of installing and equipping a five-room house with these heaters will be approximately $160, as against about $250 for a

[*Continued on page* 129]

Left: Interior of one of five-room electric homes provided for workers building Grand Coulee Dam at Mason City, Washington. Portable electric heaters in 1½ to 6 kw. sizes, like that under windows, are used in each room.

Chimneyless homes like that shown at right were erected by crew of six men at rate of six a day, after lumber was cut to size and trimmed in Spokane mill.

CLIPPING DOLLARS FROM AUTO RUNNING EXPENSES

by
MAXWELL REID GRANT

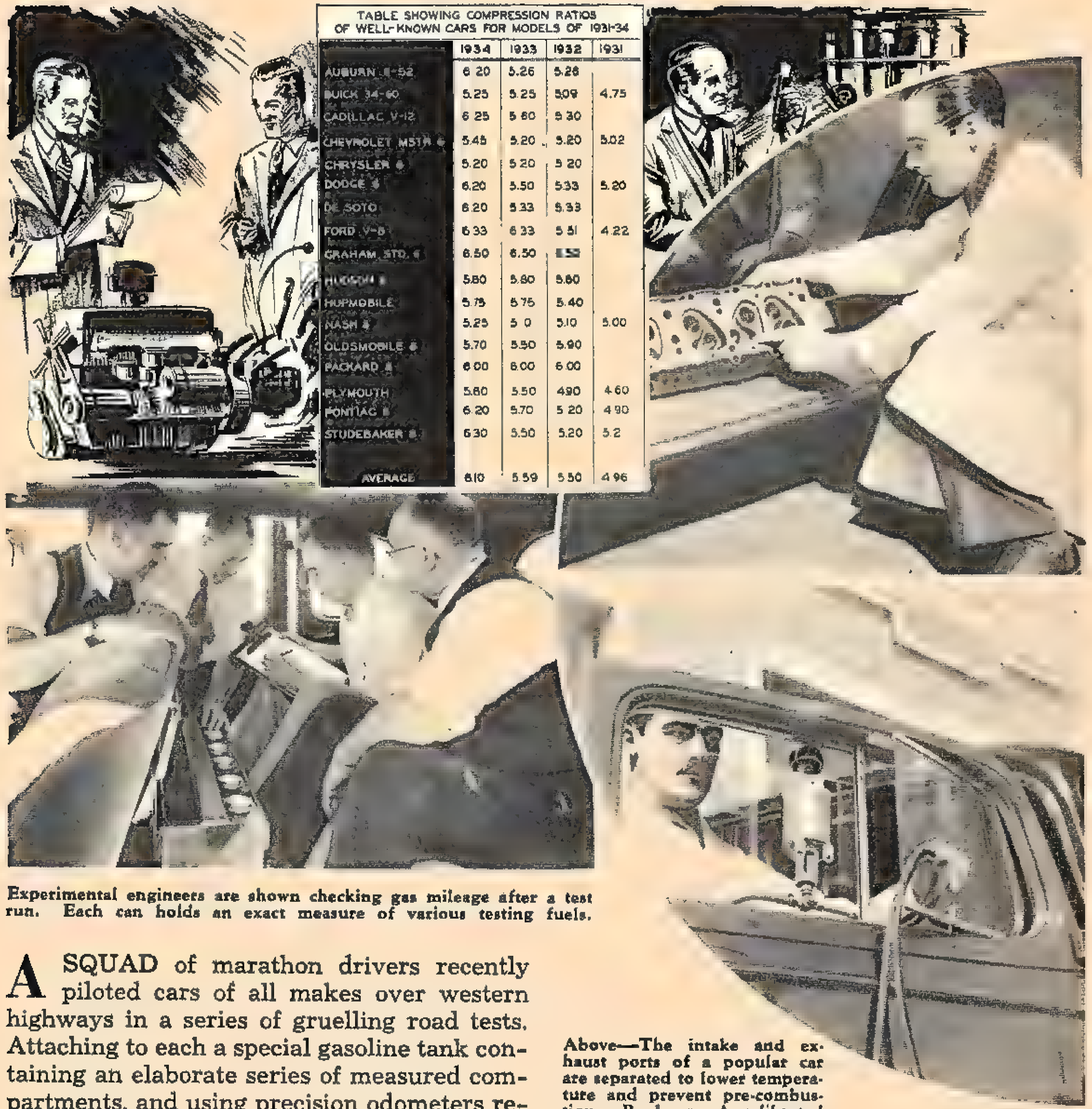


TABLE SHOWING COMPRESSION RATIOS OF WELL-KNOWN CARS FOR MODELS OF 1931-34

	1934	1933	1932	1931
AUBURN 8-52	6 20	5.26	5.26	
BUICK 34-60	5.25	5.25	5.09	4.75
CADILLAC V-12	6 25	5 60	5 30	
CHEVROLET MSTR 6	5.45	5.20	5.20	5.02
CHRYSLER 6	5.20	5 20	5 20	
DODGE 6	6.20	5.50	5.33	5.20
DE SOTO	6.20	5.33	5.33	
FORD V-8	6 33	6 33	5 51	4.22
GRAHAM STD. 6	6.50	6.50	5.52	
HUDSON 8	5.80	5.80	5.80	
HUPMOBILE	5.75	5.75	5.40	
NASH 8	5.25	5 0	5.10	5.00
OLDSMOBILE 6	5.70	5.50	5.90	
PACKARD 8	6 00	6.00	6.00	
PLYMOUTH	5.80	5.50	4.90	4.60
PONTIAC 8	6.20	5.70	5 20	4.90
STUDEBAKER 8	6.30	5.50	5.20	5.2
AVERAGE	6.10	5.59	5.50	4.96

Experimental engineers are shown checking gas mileage after a test run. Each can holds an exact measure of various testing fuels.

Above—The intake and exhaust ports of a popular car are separated to lower temperature and prevent pre-combustion. Below—A calibrated measure full of fuel is attached to window to test gas mileage.

Above left—Adjusting a carburetor for leanness and idling speed helps keep the motor in tune. Below—The "octane selector" adjusts the motor to handle the fuel that is being used.

Above—Charles F. Becker is shown at the controls of the elaborate equipment used to test gas consumption under varying conditions. Left—Adjusting the heat control on a popular car prevents waste from imperfect fuel combustion.

A SQUAD of marathon drivers recently piloted cars of all makes over western highways in a series of gruelling road tests. Attaching to each a special gasoline tank containing an elaborate series of measured compartments, and using precision odometers recording distance down to 1-1000th of a mile, they put their automobiles through weird and racking ordeals. They ran them up-hill at a snail's pace, raced them into the wind, climbed to 10,000-foot mountain peaks, made rocket-like getaways, and squealed to sensational stops in clouds of burning rubber smoke. They tried every gas and oil known to man in various combinations, using high precision instruments to record the results. Then, from notebook, table, and chart, they read figures which revealed secrets of stingy driving by which a driver can actually cut his gasoline bills as much as fifty per cent.

Do you know your engine's compression ratio? Probably not three drivers in a hundred do, yet this information is important in choosing the right fuel for economy and power.

Do you know what octane number is best to use?

Are you on speaking terms with SAE numbers in grading oils?

These things are more than obscure engineer's jargon; they mean a chance to fit your car with gasoline tailored to meet its needs, and to save many dollars in fuel, oil, and repairs.

The way you drive probably has more to do with your gasoline bill than any other factor. Records prove that modern cars can be run economically. Last year the dealers for a popular make of car staged a "Scotch driver" contest, in which the public was invited to see how far they could drive on a pint of gasoline. The fuel was put into an accurate glass measuring tube, attached to the window beside the driver, so that he could see for himself how much he was using. Rubber tubing connected the device to the fuel line. All contestants drove over the same route, which was fairly level but took them through some city traffic.

When the scores were turned in, many people refused to believe them, for the winners drove as far as 50 miles to the gallon! There was no trick, however. "Scotch" driving, plus a carefully tuned motor, was the secret.

Automobile men are chuckling over a story that is still going the rounds. Dealers for a light car no longer manufactured, set out to

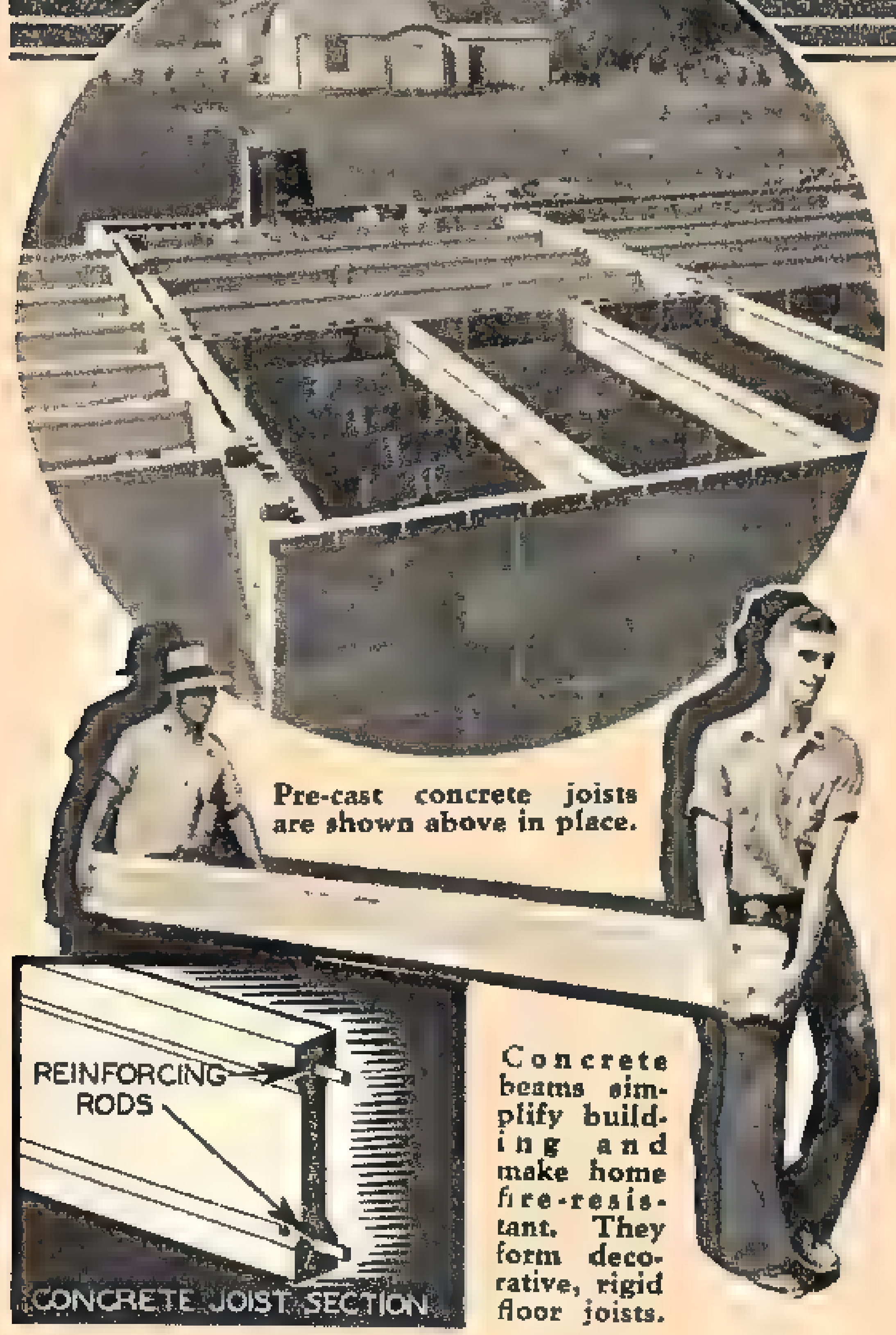
[Continued on page 123]

SCIENCE BUILDS *the* MODERN HOME

From chimney top to basement the 1935 home is new. If you want your home to keep step with science, read this story.

***by* PAUL D. PADDOCK**

This modern, entirely fireproof home was built for $2,700. It is 100 per cent concrete. Cement paint covers the walls.



Pre-cast concrete joists are shown above in place.

Concrete beams simplify building and make home fire-resistant. They form decorative, rigid floor joists.

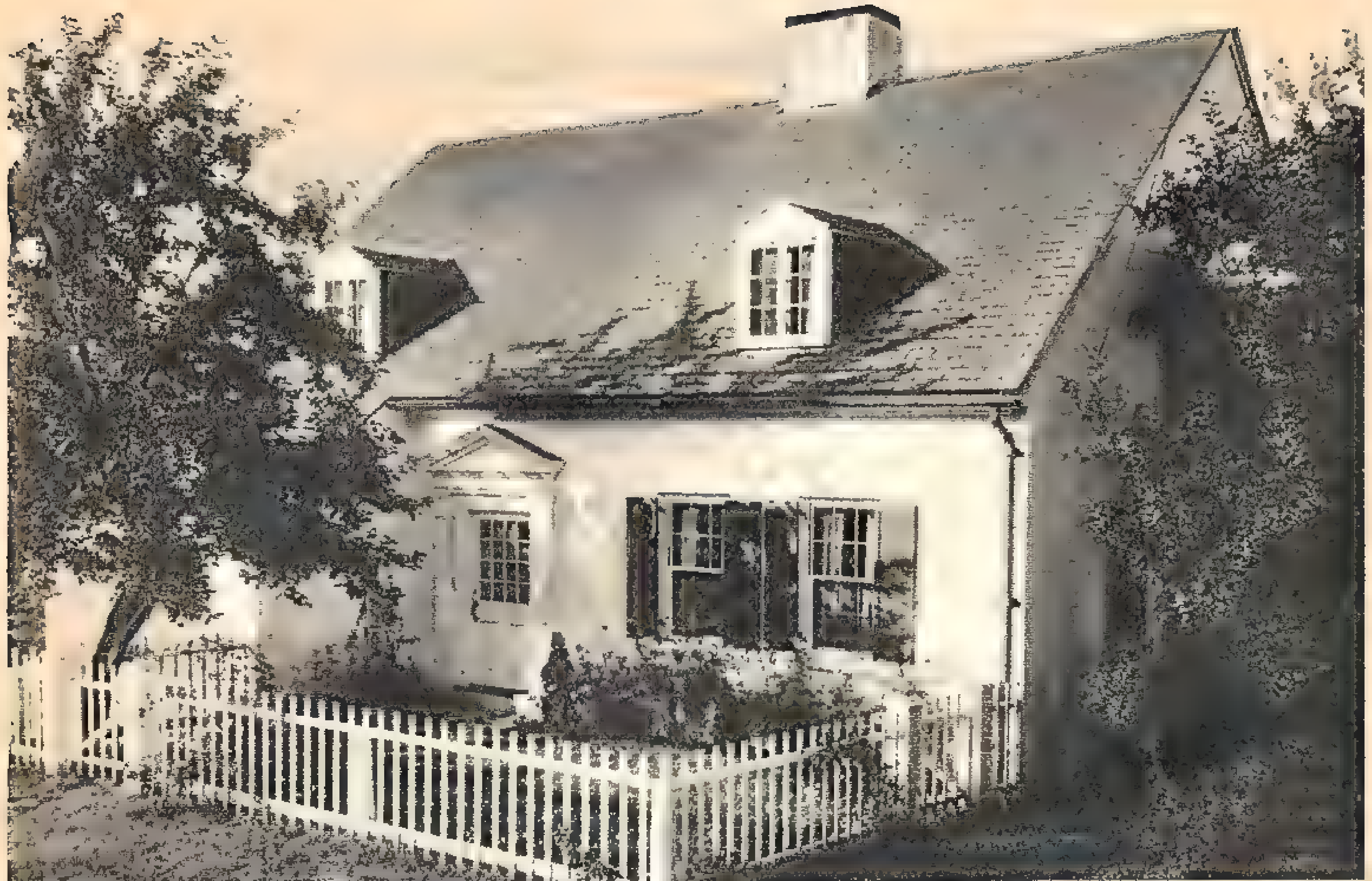
FOUNDATIONS are rising, hammers are swinging and new roofs are gleaming in the sun! America is building new houses!

In 1933 and 1934, we built less than 80,000 family homes, a pitiful total for a nation of 30,000,000 growing families. Conservative authorities declare that we have a shortage of more than 600,000 homes. This year will see 100,000 new houses built, possibly more, as the gigantic task of home-building gets under way.

The 1935 model is not just another house. From chimney top to basement it's new. More than 300 materials, structural, decorative and otherwise, new to what commonly was in usage six years ago, are now on the market. Scores of others are in the laboratory stage.

Science has turned house-builder. It offers the builder a product that, in some respects, is as far in advance over the old-fashioned house as today's automobile is ahead of the earliest models.

The house that science already has built and is building today cuts fuel bills. Reductions of fifteen to thirty per cent are common matters of record. The new house cuts the cost of summer cooling and promotes the efficiency of air-conditioning apparatus the year around.



This Cape Cod cottage with latest home improvements was built for $6,000. Walls are of concrete, painted white.

It saves steps. Where a woman walks four miles a day doing her work in an old-fashioned house, she walks three or less in a modern house of equivalent service.

The house science is building is far easier to keep clean and far more healthful. It is justifying lower insurance rates and other maintenance costs. It is more successfully built to withstand storms of all sorts, fires, and insect ravages. It is styled for the times and for the people in step with the times.

Common sense is replacing convention.

The above statements are not claims. They are facts. Houses already up and occupied prove every assertion just made. This article does not relate to the "fad" house or the "freak" house. The new house that science is building is as natural as the automobile and fully as necessary.

Economy, greater simplicity, smart new style, interesting use of color—these and other generalities apply to the new house, but take a look at some of the specific products that go into this new American abode.

Blankets for the house roof and walls, such as the above, are made from limestone, slag, glass and other materials to reduce heat losses and keep out summer temperatures.

Air-conditioning and the new insulations it has inspired, form one of the most interesting chapters in this new building drama. Just recently, engineers dusted off an old scientific principle and put it to work to make modern

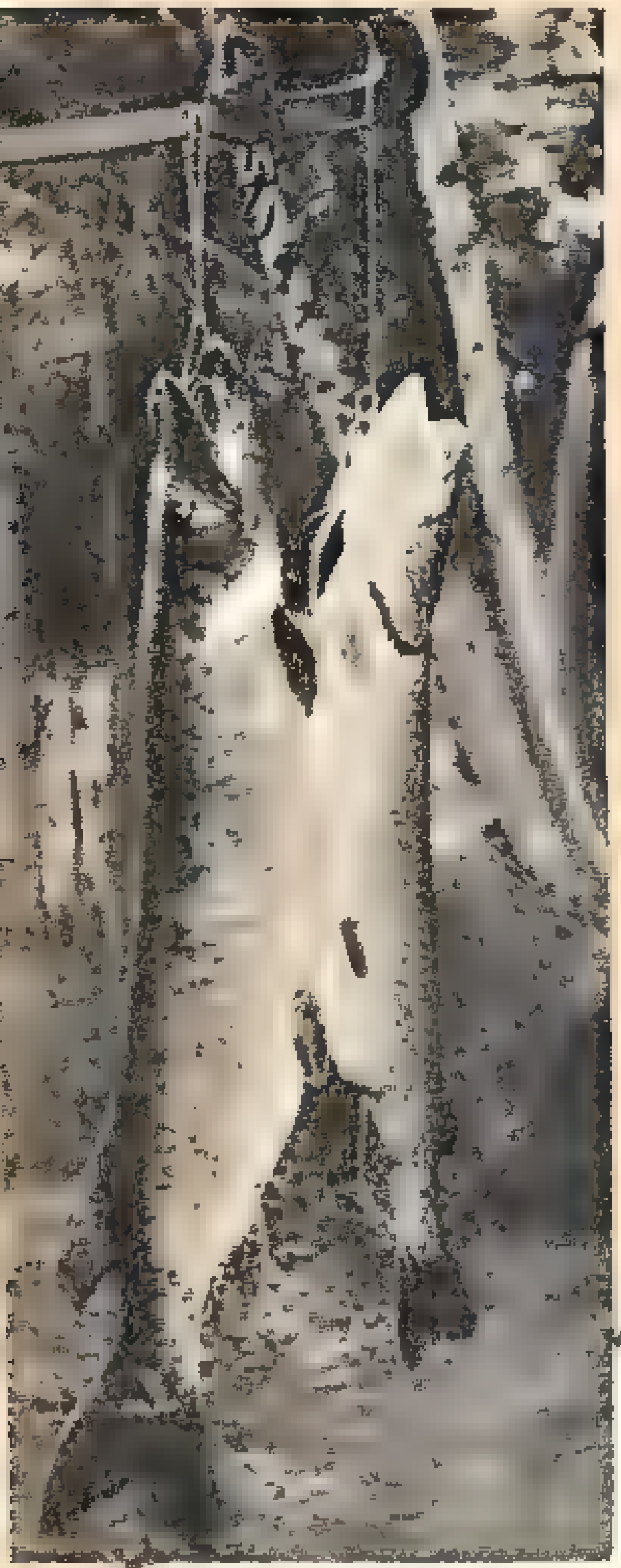
CAN YOU IDENTIFY THE FISH YOU CATCH?

by

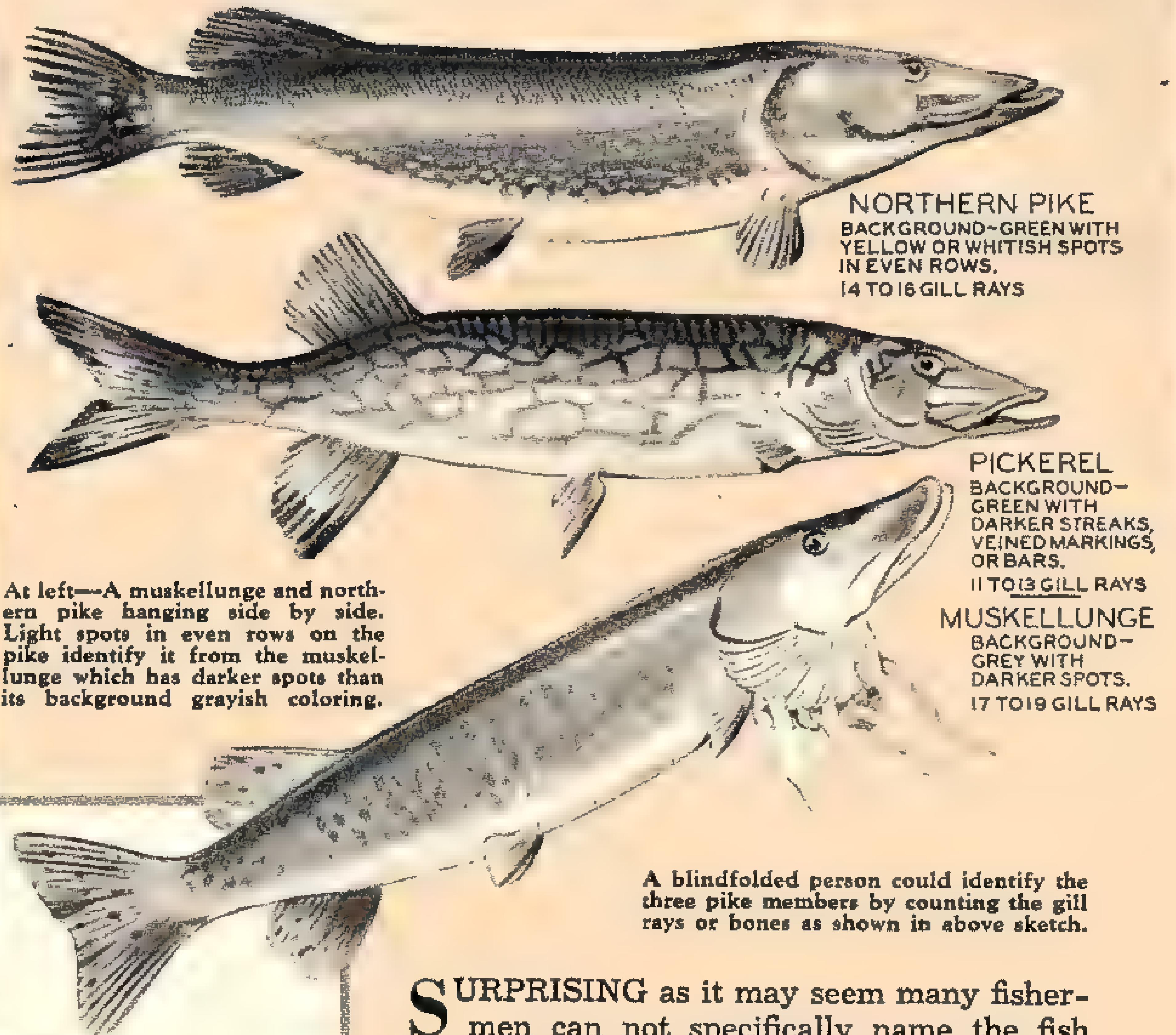
ROBERT PAGE LINCOLN

Hunting and Fishing Editor

The "pickerel" you are catching may be small northern pike. Although you may know your fish, the statements of this expert may surprise you.



At left—A muskellunge and northern pike hanging side by side. Light spots in even rows on the pike identify it from the muskellunge which has darker spots than its background grayish coloring.


NORTHERN PIKE
BACKGROUND—GREEN WITH YELLOW OR WHITISH SPOTS IN EVEN ROWS.
14 TO 16 GILL RAYS
PICKEREL
BACKGROUND—GREEN WITH DARKER STREAKS, VEINED MARKINGS, OR BARS.
11 TO 13 GILL RAYS
MUSKELLUNGE
BACKGROUND—GREY WITH DARKER SPOTS.
17 TO 19 GILL RAYS

A blindfolded person could identify the three pike members by counting the gill rays or bones as shown in above sketch.

SURPRISING as it may seem many fishermen can not specifically name the fish they catch. They will say, "It looks like a perch" or "It's a bass," but whether it is a large mouth or small mouth, they can not say.

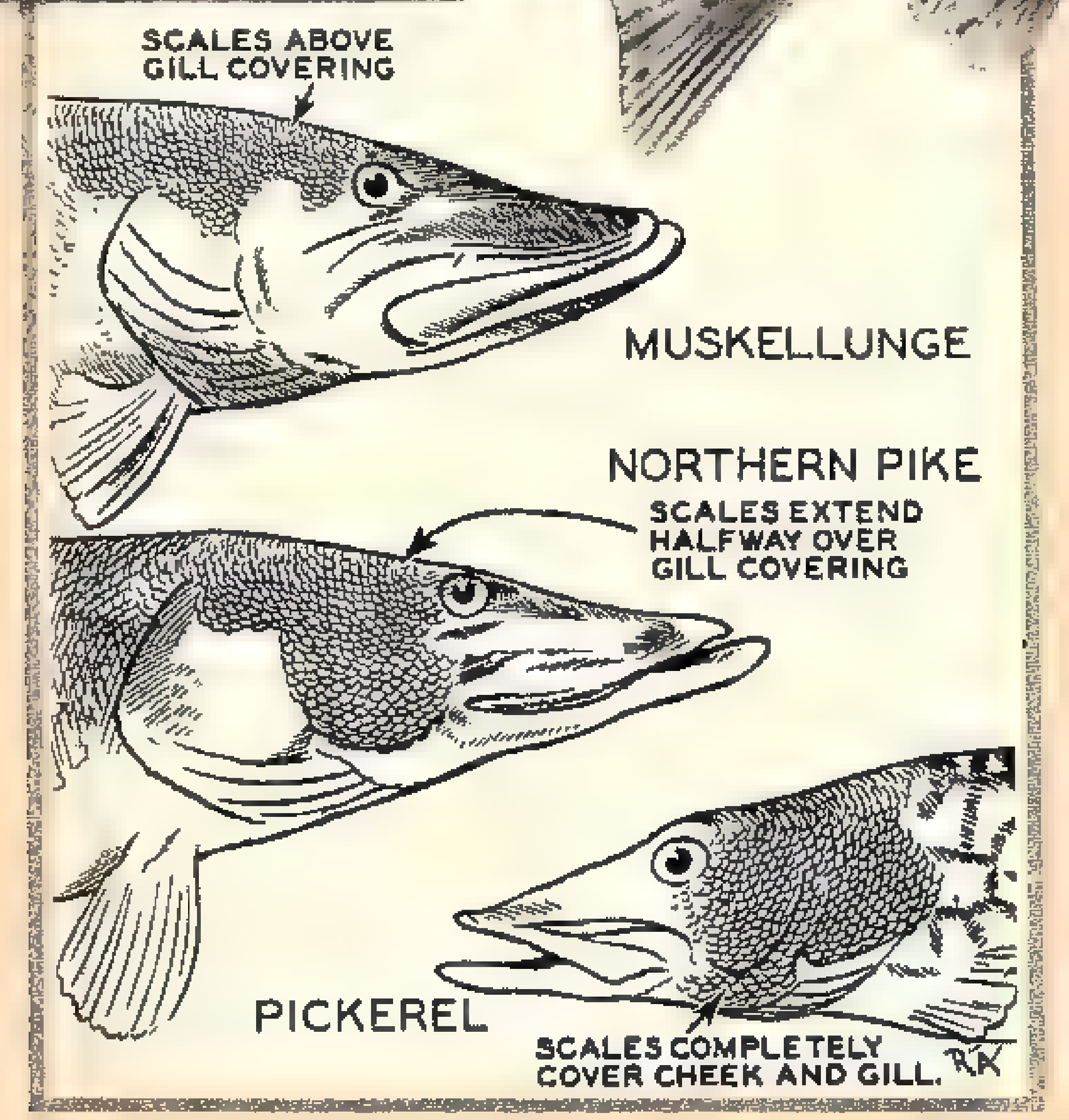
In some ways this is true even among experienced fishermen. Some of them can not distinguish between the pickerel and the northern pike, and the northern pike and the muskellunge.

No greater confusion exists than in identifying the members of the pike family which includes three species, the muskellunge, great northern pike, and pickerel. The tendency is to bracket the great northern pike and the three members of the true pickerel species into one. In the same way the muskellunge and the great northern pike have been confused. Some fishermen believe that when a great northern pike grows large in size, it becomes, not a pike, but a muskellunge. Hence we often see a large pike panned off as muskellunge. Every fisherman to gain the most out of the fishing pastime should know the fish he angles for!

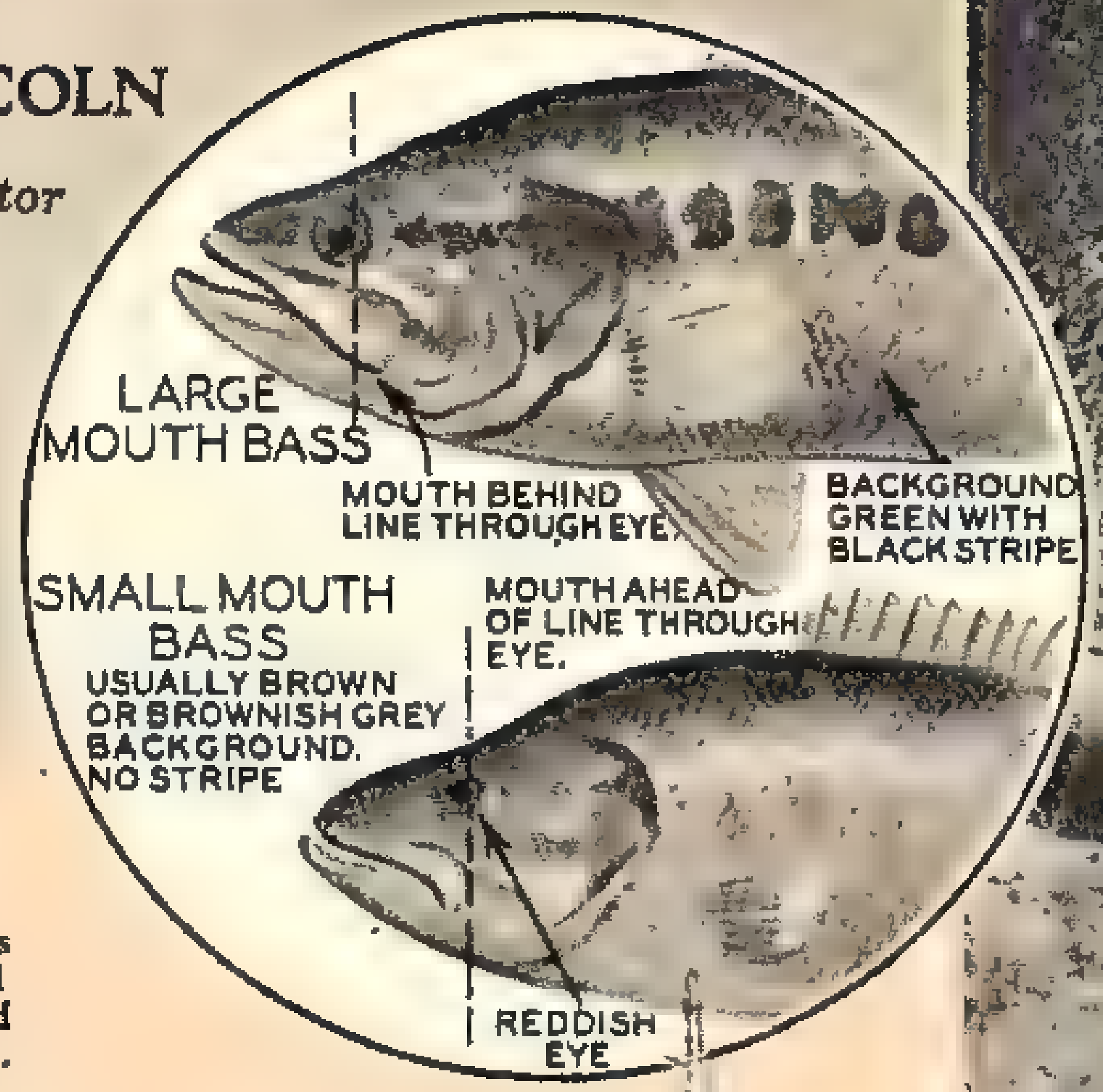
While there are three varieties of the muskellunge in North America (the only place in the world where the species is found), they are all very much alike, save for a few varying spots, blotches, or bars on the body. The three varieties are: the northern or unspotted muskellunge (*Esox immaculatus*); the spotted or St. Lawrence muskellunge (*Esox masquinongy*); and the Chautauqua muskellunge (*Esox ohioensis*). All three may be found hobnobbing in common in the same water. The fisherman should know that a muskellunge is a muskellunge whether it is unspotted, spotted, barred, or striped.

So far as size and length is concerned, the great northern pike rarely comes up to the mark set by the muskellunge. Following the same line of comparison it may be said that few true pickerel ever get as large as a six or eight pound great northern pike. Most pickerel range around a foot to fourteen inches in length.

In coloration alone the muskellunge differs from the great northern pike, the only fish with which it could possibly be confused. The background coloration of the muskellunge is some shade of gray, either light or dark gray, whereas the pike is green in background color,

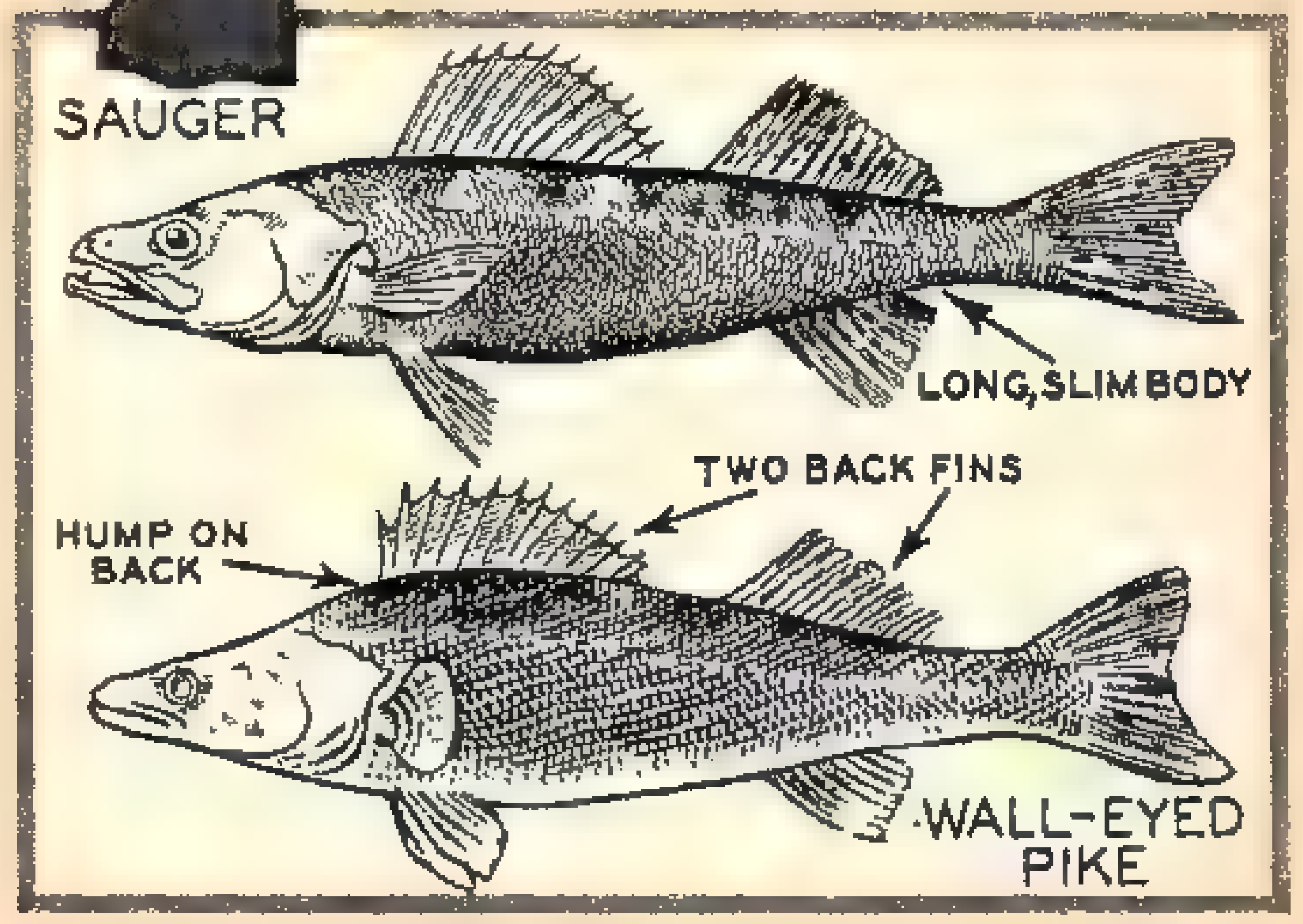

SCALES ABOVE GILL COVERING
MUSKELLUNGE
NORTHERN PIKE
SCALES EXTEND HALFWAY OVER GILL COVERING
PICKEREL
SCALES COMPLETELY COVER CHEEK AND GILL.
RK

To identify pike family note the scale covering on the cheeks and gill covers. The lower half of the cheeks and gill covers are free of scales in the muskellunge, while the cheek of northern pike is completely scaled, but only half the gill is covered. Both cheek and gill are completely scaled in pickerel.


LARGE MOUTH BASS
MOUTH BEHIND LINE THROUGH EYE
BACKGROUND GREEN WITH BLACK STRIPE
SMALL MOUTH BASS
USUALLY BROWN OR BROWNISH GREY BACKGROUND. NO STRIPE
MOUTH AHEAD OF LINE THROUGH EYE.
REDDISH EYE

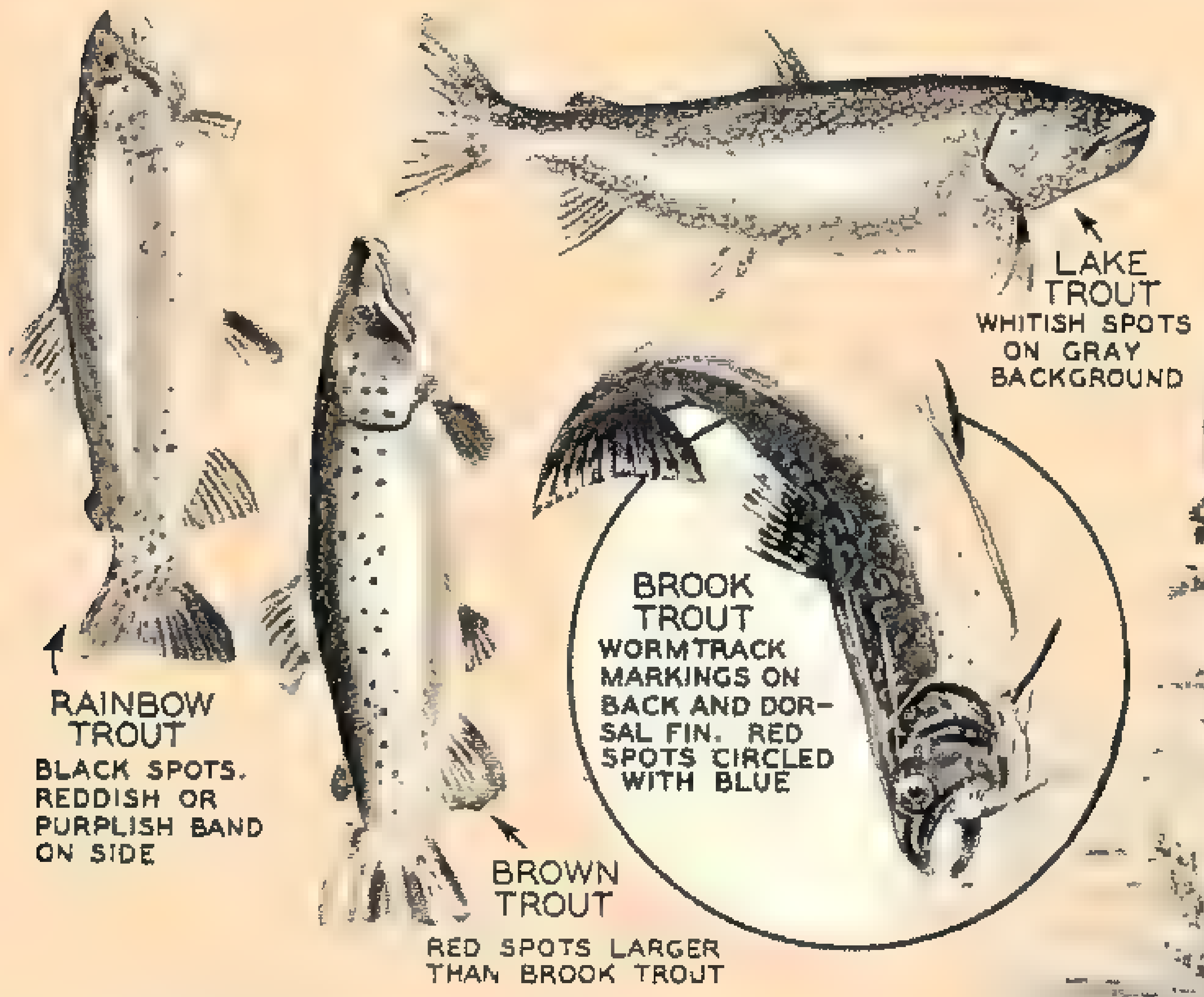
Line drawn through eye of bass, as shown at right, will distinguish small mouth from the large mouth. Red eye of small mouth will identify it. Scales of small mouth bass are small.

Above is an excellent specimen of a muskellunge caught by the author. It weighed 35 pounds. It was partly blotched or spotted with wavy streaks. At left is a large mouth bass. Note its flabby stomach which is not found in the small mouth bass. The background coloring of the large mouth is green.


SAUGER
LONG, SLIM BODY
TWO BACK FINS
HUMP ON BACK
WALL-EYED PIKE

The wall-eyed pike and sauger are really members of the perch family. Both look much alike. The sauger, however, is a slimmer fish, is lighter in coloring, and usually weighs less. The body of the wall-eye is rough. Pike family members have slimy scale covering and have just one back fin.

MARKINGS IDENTIFY Four Species of TROUT


LAKE TROUT
WHITISH SPOTS ON GRAY BACKGROUND
RAINBOW TROUT
BLACK SPOTS. REDDISH OR PURPLISH BAND ON SIDE
BROOK TROUT
WORMTRACK MARKINGS ON BACK AND DORSAL FIN. RED SPOTS CIRCLED WITH BLUE
BROWN TROUT
RED SPOTS LARGER THAN BROOK TROUT

Distinguishing characteristics of four trout commonly found in American waters are shown above. Brown and brook trout may be confused, but the latter has small scales scarcely seen with the eye, small red spots, and worm-track marked fins.

This 34-lb. lake trout was caught in the Lake of the Woods, Minn. Except at the tail, most of its spots have vanished.

sometimes light green and sometimes dark green depending upon the water from which it is taken.

On the grayish background coloration of the muskellunge there are darker spots or blotches. In comparison, the spots on the great northern pike, instead of being dark, are pale yellow or whitish and are set more or less evenly in rows up and down the sides. These rows of spots on the side are possessed alone by the pike; the muskellunge does not have them, nor do any of the true pickerel. These rows of light, yellowish spots should at once set the pike apart from the other members of the pike family.

Two unfailing means of recognizing the members of the pike family is to take note of the scaling on the cheeks and gill covers and to count the number of rays or bones in the gill covers or opercles.

In the muskellunge the upper part of the cheeks and the gill covers are scaled, the lower half of each being free from scales. In the great northern pike the cheeks are completely scaled, but the lower half of the gill covers are bare of scales. In the three true pickerel both the gill covers and cheeks are covered with scales!

Spread the gill cover of a member of the pike family whose identity you wish to establish. By running your finger and thumb along the lower edge of it you will note the bones that line it, being about a fourth of an inch apart. These bones, or branchiostegal rays, as they are called, aid the fish in opening and closing the gill covers as it breathes. The number of bones in this gill cover tells you what sort of fish you have.

In the muskellunge each gill cover, left or right on the fish, contains each 17 to 19 of these rays. The great northern pike ranges 14 to 16, while all three pickerel have 11 to 13 rays in each gill cover. It is interesting to state that one should be able to tell any of the three members of the pike family apart with eyes closed, merely by running the fingers over the gill cover edges and counting the number of rays that each possesses!

There are three pickerel recognized in this country, namely, the eastern or chain pickerel (*Esox reticulatus*); the little pickerel, or

[*Continued on page* 124]

Following the Birds on their Migratory Trek

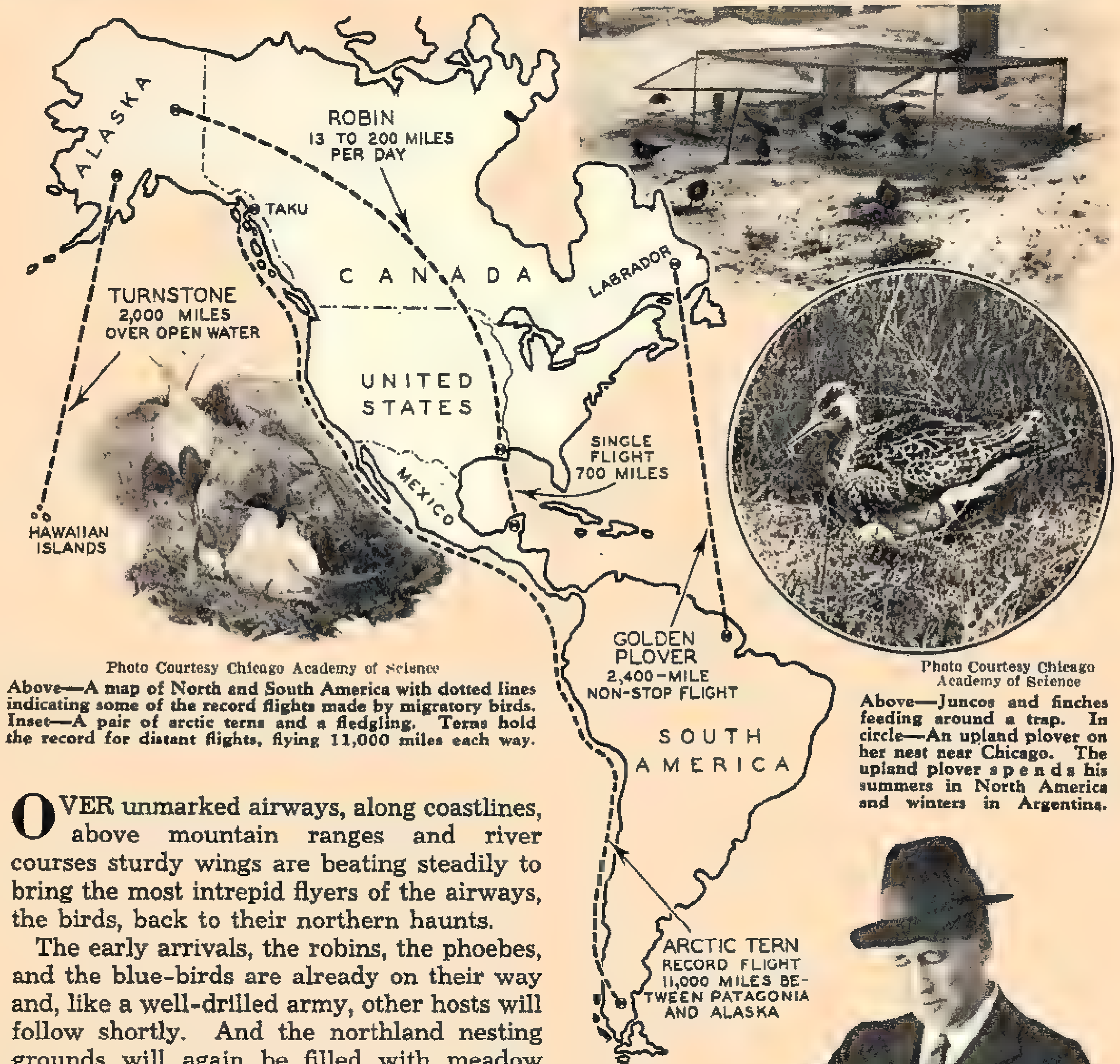

ALASKA
ROBIN
13 TO 200 MILES PER DAY
TAKU
CANADA
LABRADOR
TURNSTONE
2,000 MILES OVER OPEN WATER
UNITED STATES
SINGLE FLIGHT 700 MILES
MEXICO
HAWAIIAN ISLANDS
GOLDEN PLOVER
2,400-MILE NON-STOP FLIGHT
SOUTH AMERICA
ARCTIC TERN
RECORD FLIGHT 11,000 MILES BETWEEN PATAGONIA AND ALASKA

Photo Courtesy Chicago Academy of Science

Above—A map of North and South America with dotted lines indicating some of the record flights made by migratory birds. Inset—A pair of arctic terns and a fledgling. Terns hold the record for distant flights, flying 11,000 miles each way.

Photo Courtesy Chicago Academy of Science

Above—Juncos and finches feeding around a trap. In circle—An upland plover on her nest near Chicago. The upland plover spends his summers in North America and winters in Argentina.

OVER unmarked airways, along coastlines, above mountain ranges and river courses sturdy wings are beating steadily to bring the most intrepid flyers of the airways, the birds, back to their northern haunts.

The early arrivals, the robins, the phoebes, and the blue-birds are already on their way and, like a well-drilled army, other hosts will follow shortly. And the northland nesting grounds will again be filled with meadow larks, warblers, thrushes, swallows, swifts, martins, orioles, and countless other migratory birds.

It is a strange movement, this annual migration of the birds. Man gasps in amazement at some of the feats the hardy travelers perform in their semi-annual trips ranging from 1,000 to 11,00 miles in length. Even the common robin and many of the other smaller birds make sustained trips of 700 miles without food, and the golden plover, flying between northern South America and Labrador, goes in a direct route, 2,400 miles over the open waters of the Atlantic, without food or rest. The turnstone, another trans-

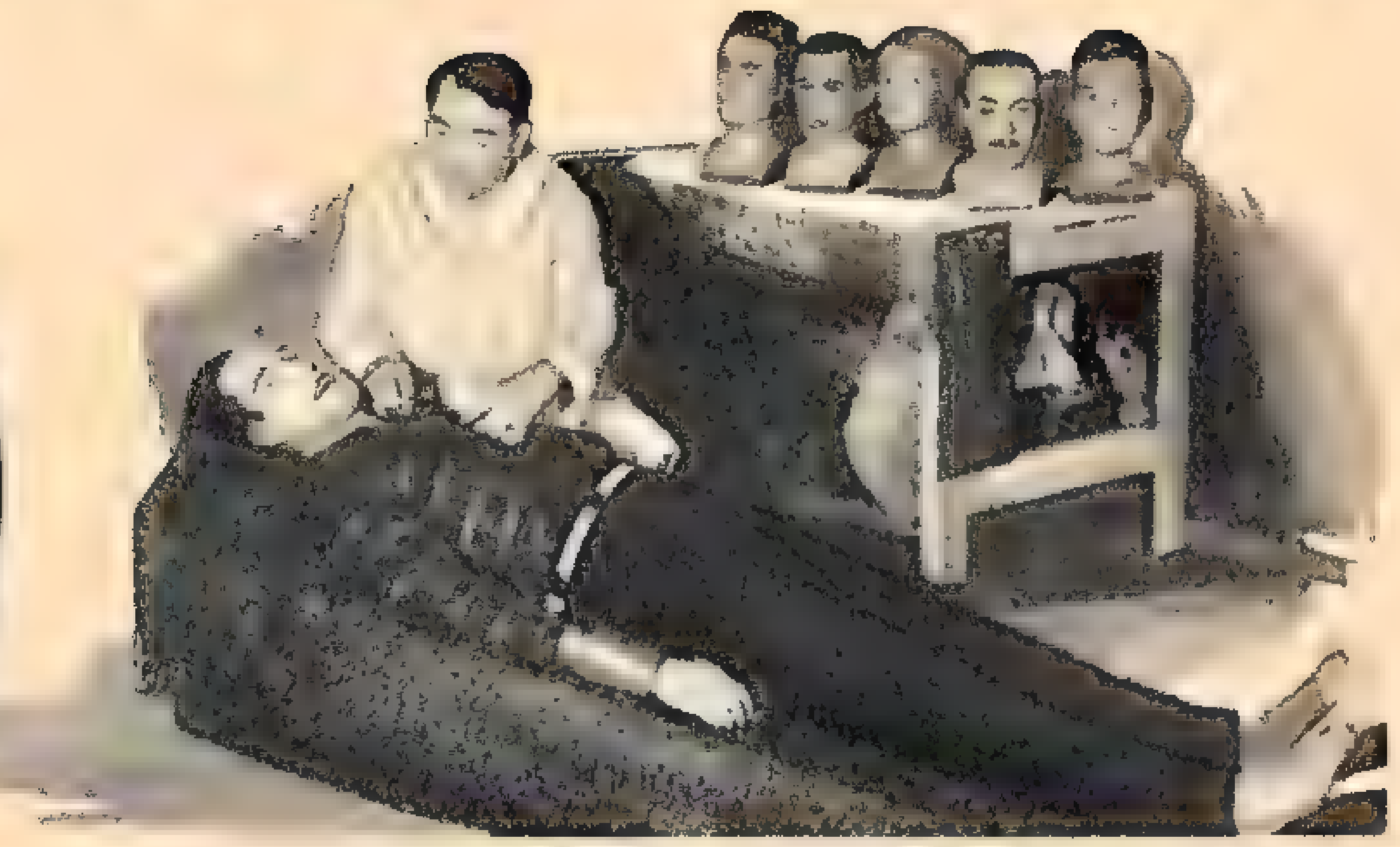
[*Continued on page* 130]

Right—The photo shows a bird enthusiast attaching a band to the leg of a young herring gull. The bands are numbered, and a record is sent to the government Biological Survey telling the species of bird, the band number, and the locale in which he was found for future study.

CREATING LIFE LIKE Figures For WAX MUSEUMS

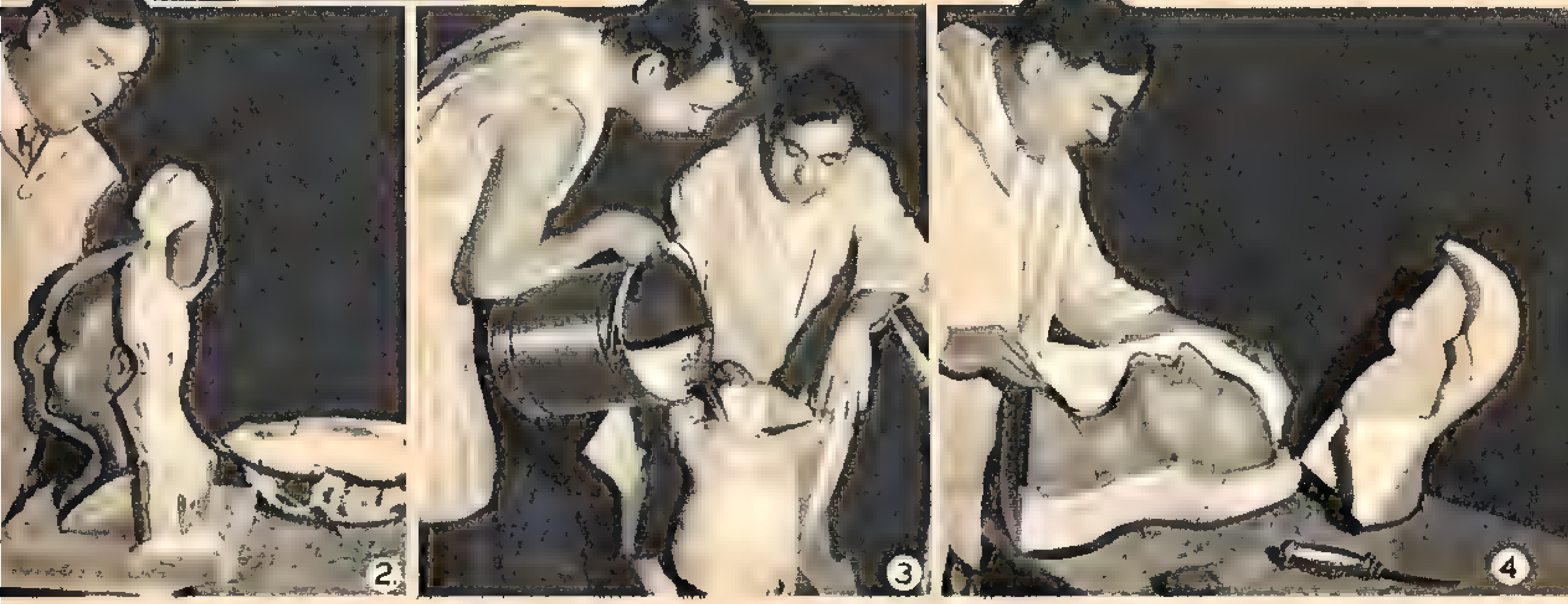
by HAROLD L. ZIMMER

Washington, Roosevelt, Billy the Kid, Jesse James! All the world's most colorful figures stand out with startling reality in a wax museum. This article tells how workers transfer a simple photograph into amazingly life like figures sculptured in tinted wax.

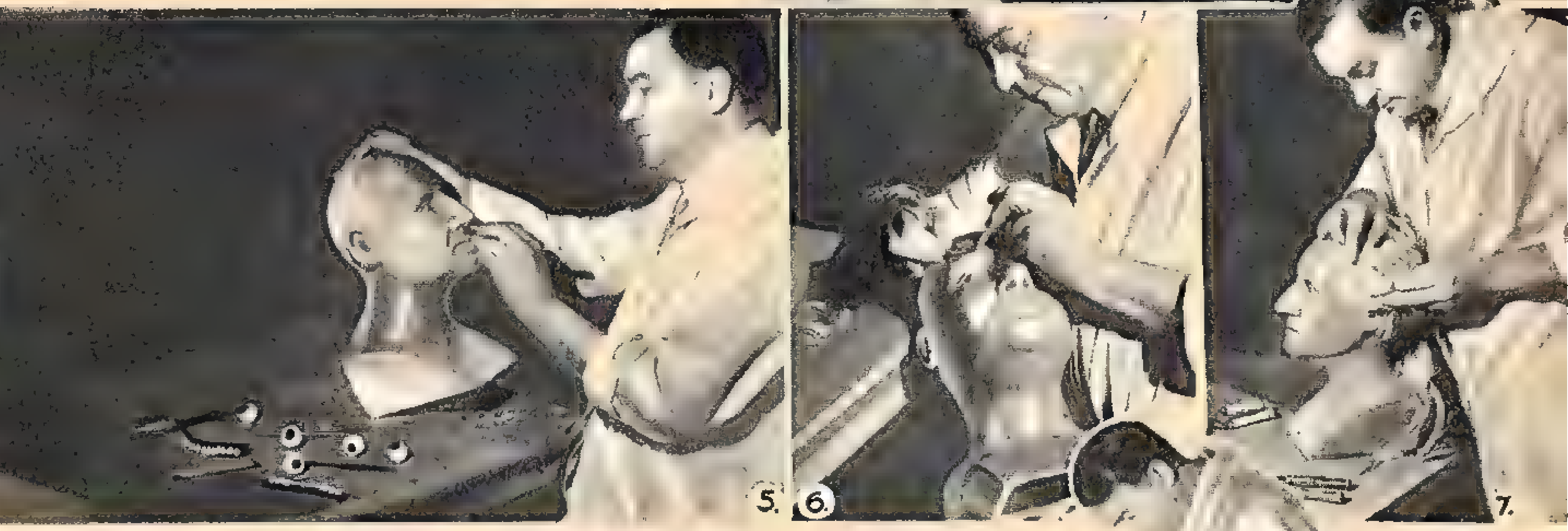


Left—The artist takes the first step on a model of George Washington by molding a clay model. Above—Preparing a notorious western bandit for the "death act." Only exposed parts are wax—clothes cover papier mache body.

Right—The author, Harold Zimmer standing between wax models of "Wild Bill" Hickock at left and the famous fighter, Billy the Kid.



Left—The worker building up the back panel of a plaster mold over the first clay model. Center—Pouring the wax into the plaster mold. Right—Breaking the unfinished wax head out of the mold. It is now ready for hair and teeth.



Left—Inserting the teeth and applying the finishing touches on the features. Center—Setting the eyelashes. Each hair is driven into the model with a pointed punch to gain natural appearance. Right—Human hair, each one individually inserted, is used to complete the model head of George Washington molded from special wax.

WHERE do the horrors in the wax museums come from? This question may have troubled you as you paused in a side show for a few pleasant shudders. So realistically are they made, so gruesomely exact in every tiny detail, that it would seem the artist must have had the original models pose especially for him.

Let us visit a man in St. Louis who manufactures these macabre specimens in his workshop. It surely will be exciting, and we may learn something in addition.

Arriving at our destination, we opened the door with shivery anticipation—

Instead of the ghostly, dimly-lit laboratory-studio of cobwebs, shadowy corners and bobbling witches' kettles—presided over by some evil-visaged, misshapen gnome, which we expected, we found just the oposite. A stout, jolly man of about forty-five, with a booming, cheery voice, bade us welcome.

"How do I do it?" he laughed. "Come right in. Bill and I are just running off a cast of George Washington!"

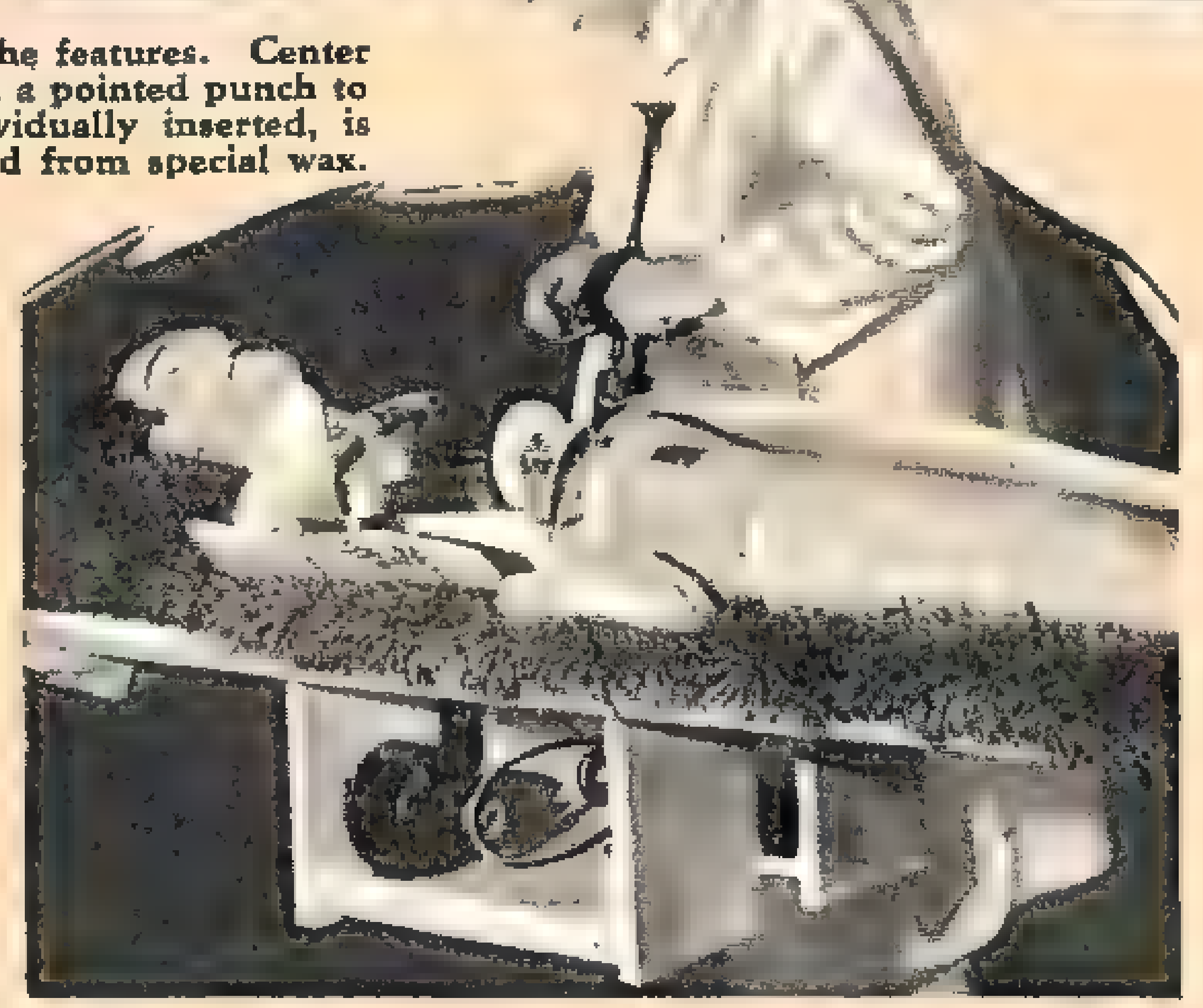
We stepped into a well-lighted, well equipped workshop. Bill, a soft-spoken young man of twenty-two nodded a greeting.

Mr. Christophel walked over to a well executed head of George Washington, sculptured in modeling clay. "This is the first step in making wax figures," he stated. "I'm just putting the finishing touches to it now. Next—" he reached for a bottle of oil. "I grease the clay head thoroughly, to keep it from sticking to the plaster.

"People often wonder why the figures are so true to life. This is a compliment to the sculptor, for he seldom sees the original model—most of them being dead—and must go either by old pictures found in books or—as is sometimes the case—from a newspaper clipping. Figures of modern notorious characters and celebrities are often found in this way.

"A wax worker's art is not always gruesome," Chris continued, taking the finished clay model over to where Bill was

[*Continued on page* 122]

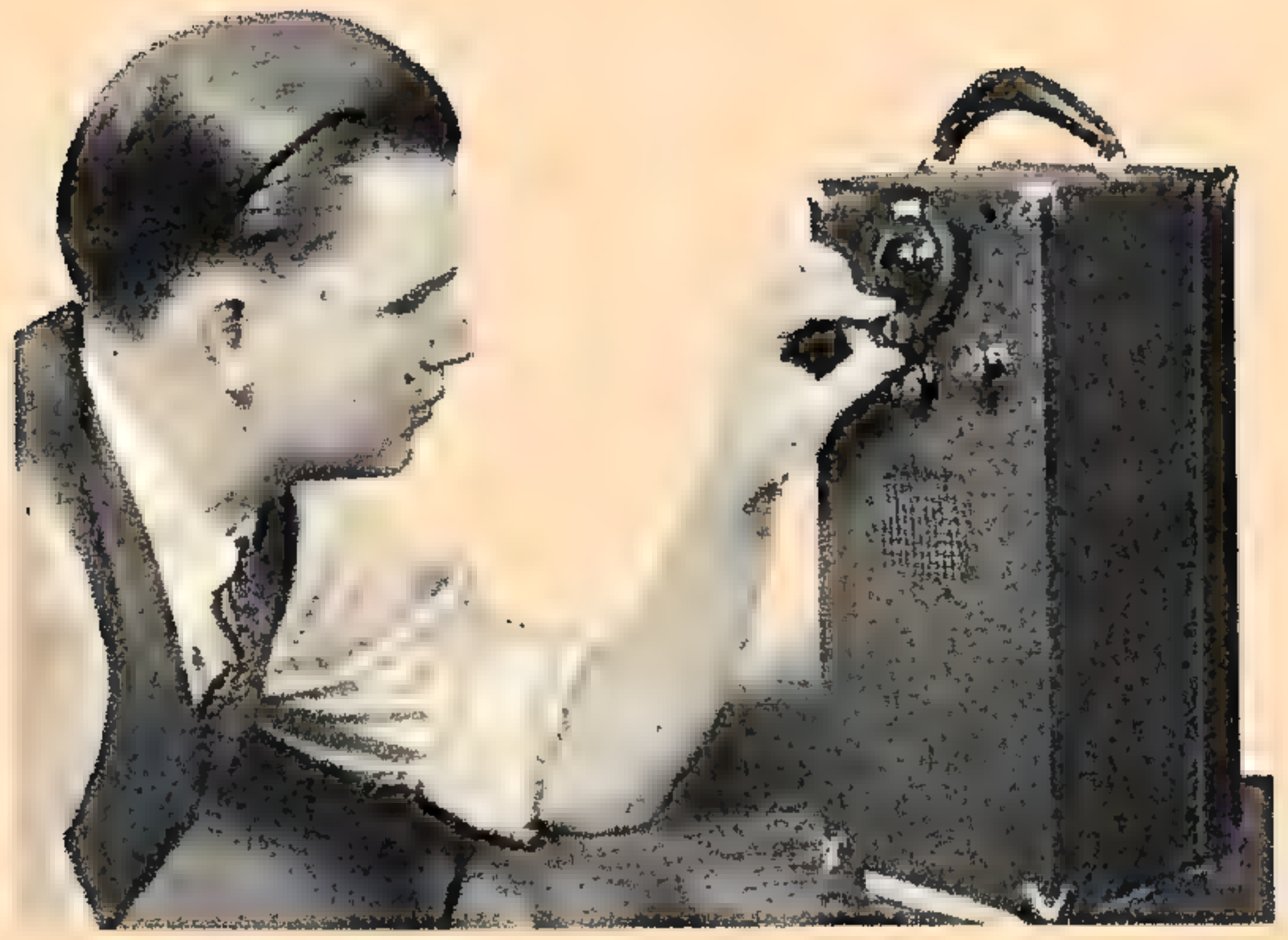


The breathing mechanism exposed. A silent electric motor runs a reduction gear which is timed to conform with regular breathing. The machine can be regulated to produce the breath of a sleeping beauty or the gasps of a dying bandit.

Hear All-Wave Programs With 3-Tube TOOL BOX Portable

Though no plug-in coils are used, programs down to 35 meters can be heard with speaker volume on this powerful long and short wave portable receiver.

by P. M. OHLINGER



Set your toolbox portable anywhere, connect up antenna and ground leads, flip the switch, and take your pick of music, police calls, or amateur short wave broadcasts o'er the continent. Switch for long or short antenna is on back cover.

SIMPLY connect up the aerial and ground wires, and this powerful little receiver is ready to pick up stations anywhere in this country, on any band from 35 to about 370 meters, with good volume on the built-in midget loudspeaker. Take it anywhere—on a canoe, cruiser, or along to camp this summer—it doesn't take much of an aerial to pick up stations on the broadcast band hundreds of miles away.

An ingeniously wound coil covers four different bands simply by changing the setting on a four point selector switch. There is none of the nuisance of carrying along plug in coils for the different short wave bands, and opening up the set each time you wish to change bands.

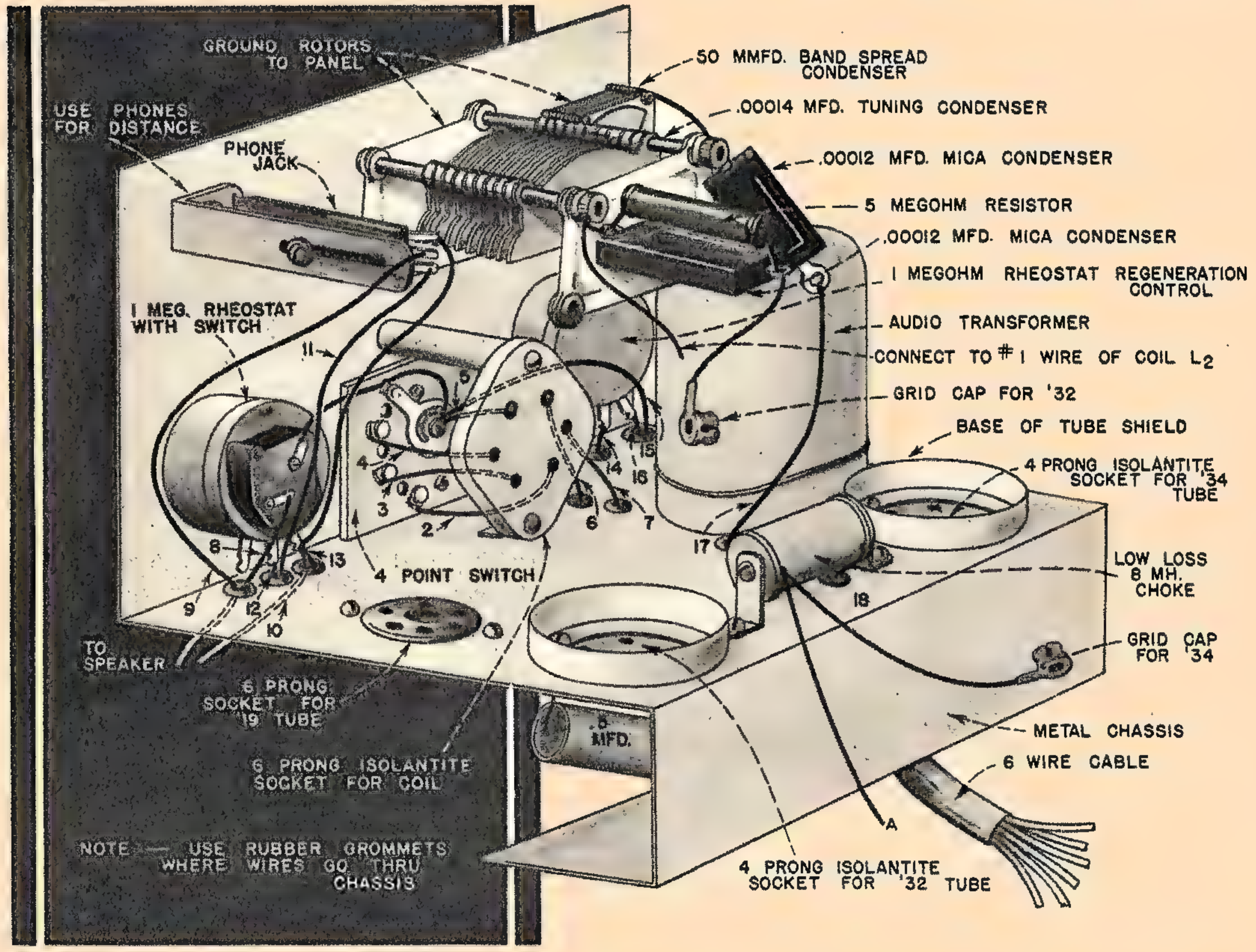
Everything is built into the single tool box cabinet. Light weight B and C batteries give unusually long service, since the current drain with the circuit used is very low. Two dry cells supply filament power.

Rain or snow have no threats for this sturdily built receiver. Its dependability makes it the ideal portable set for mining expeditions, explorers, forest patrol rangers, or even for interference finding. A phone jack is provided to permit headphone reception of distant short wave stations. When phones are used, the speaker is automatically shut off.

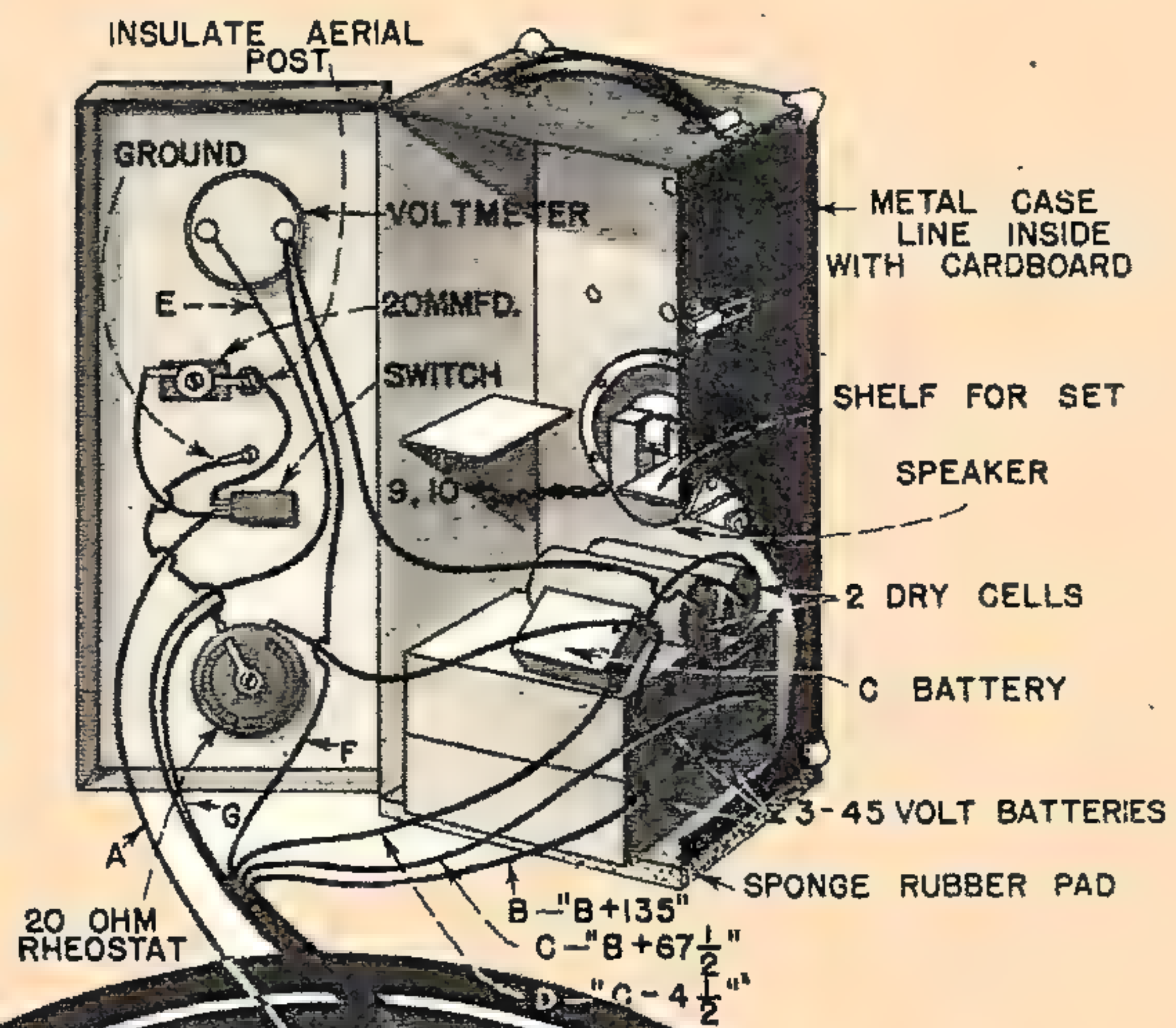
Though only three tubes are used in this set, the type '19 dual purpose tube raises the efficiency to that of a four tube receiver. Electrically the circuit is a '34 screen grid untuned r. f. stage coupled by choke and condenser to a '32 screen grid regenerative detector. Resistance coupling is used between the detector and the first a. f. stage, which is one half of the '19 tube. Transformer coupling is used between first and second audio stages, the output passing through the phone jack to the speaker.

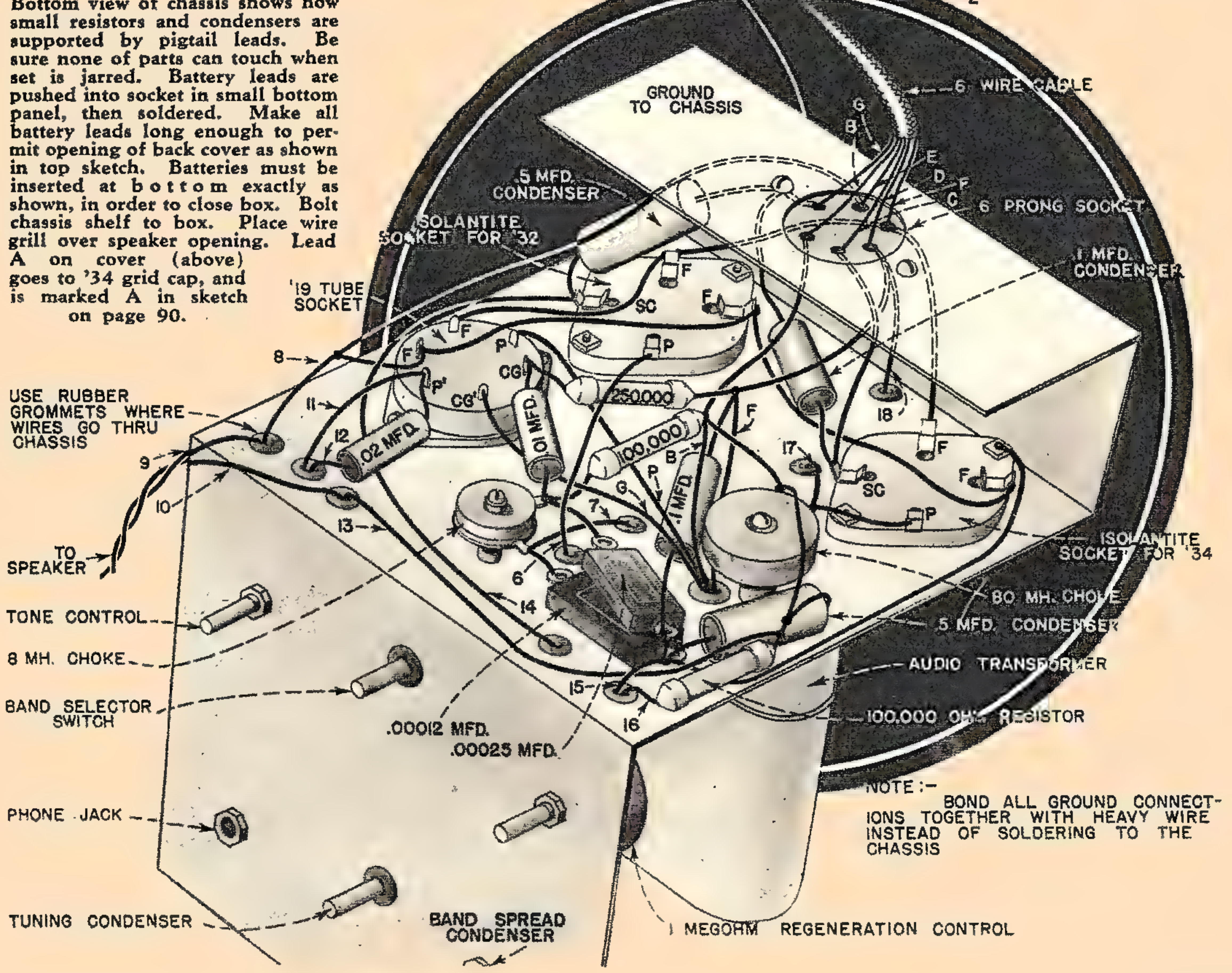
A tone control is just another of the many features found in this circuit. It may be used either for selecting the tone desired or for cutting down background noises on local reception.

A 16" by 7½" by 7¼" 22-gauge steel tool case is used as a cabinet. It presents a fine appearance and takes very little machine work.


GROUND ROTORS TO PANEL
USE PHONES FOR DISTANCE
PHONE JACK
50 MMFD. BAND SPREAD CONDENSER
.00014 MFD. TUNING CONDENSER
.00012 MFD. MICA CONDENSER
5 MEGOHM RESISTOR
.00012 MFD. MICA CONDENSER
1 MEGOHM RHEOSTAT REGENERATION CONTROL
1 MEG. RHEOSTAT WITH SWITCH
AUDIO TRANSFORMER
CONNECT TO #1 WIRE OF COIL L2
GRID CAP FOR '32
BASE OF TUBE SHIELD
4 PRONG ISOLANTITE SOCKET FOR '34 TUBE
LOW LOSS 8 MH. CHOKE
GRID CAP FOR '34
4 POINT SWITCH
TO SPEAKER
6 PRONG SOCKET FOR '19 TUBE
6 PRONG ISOLANTITE SOCKET FOR COIL
.5 MFD.
METAL CHASSIS
6 WIRE CABLE
A
4 PRONG ISOLANTITE SOCKET FOR '32 TUBE
NOTE — USE RUBBER GROMMETS WHERE WIRES GO THRU CHASSIS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18

Mounting of parts atop chassis is shown in above sketch. Ordinary 8 mh. choke gives same results as low-loss type shown.


INSULATE AERIAL POST
GROUND
VOLTMETER
E
20 MMFD.
SWITCH
9, 10
F
G
A
20 OHM RHEOSTAT
METAL CASE LINE INSIDE WITH CARDBOARD
SHELF FOR SET
SPEAKER
2 DRY CELLS
C BATTERY
3-45 VOLT BATTERIES
SPONGE RUBBER PAD
B—"B+135"
C—"B+67½"
D—"C-4½"


GROUND TO CHASSIS
6 WIRE CABLE
G
B
E
D
F
C
6 PRONG SOCKET
.5 MFD. CONDENSER
ISOLANTITE SOCKET FOR '32
1 MFD. CONDENSER
'19 TUBE SOCKET
F
SC
P
P'
CG
CG'
250,000
.02 MFD.
.01 MFD.
100,000
.1 MFD.
8
9
10
11
12
13
14
15
16
17
18
6
7
USE RUBBER GROMMETS WHERE WIRES GO THRU CHASSIS
TO SPEAKER
TONE CONTROL
8 MH. CHOKE
BAND SELECTOR SWITCH
PHONE JACK
TUNING CONDENSER
BAND SPREAD CONDENSER
.00012 MFD.
.00025 MFD.
ISOLANTITE SOCKET FOR '34
80 MH. CHOKE
.5 MFD. CONDENSER
AUDIO TRANSFORMER
100,000 OHM RESISTOR
1 MEGOHM REGENERATION CONTROL
NOTE:- BOND ALL GROUND CONNECTIONS TOGETHER WITH HEAVY WIRE INSTEAD OF SOLDERING TO THE CHASSIS

Bottom view of chassis shows how small resistors and condensers are supported by pigtail leads. Be sure none of parts can touch when set is jarred. Battery leads are pushed into socket in small bottom panel, then soldered. Make all battery leads long enough to permit opening of back cover as shown in top sketch. Batteries must be inserted at bottom exactly as shown, in order to close box. Bolt chassis shelf to box. Place wire grill over speaker opening. Lead A on cover (above) goes to '34 grid cap, and is marked A in sketch on page 90.

Build "MIDGET MILLER" —a Model Dirt Track Racer

by **WESTON FARMER**

PART I

Miniature copy of the famous Miller dirt track racer, this midget has class, beauty, and speed, yet is easily built with common workshop tools.

THIS midget car is a scale model of the famous Miller Dirt Track Special. Built for Merril M. Madsen, of Minneapolis, Minn., dirt track racer and owner of a real Miller, it combines beauty and speed with simplicity of construction.

The car shown in the photos is powered with a ¾ h.p. Briggs and Stratton motor with a kick starter reached by raising the rear hood. This motor develops a speed of 20 miles an hour. The plans and specification given, however, will do for the power head of an outboard motor or one of those washing machine motors that can be found most anywhere.

Unlike most midget cars, the "Midget Miller" has a clutch and a gear shift for forward and reverse that is a simple arrangement of V pulleys and a belt. The car can stop, start, and reverse and come to a proper halt for traffic signals. The body of the car can be built of sheet metal or of wooden molds with chicken wire and fabrikoid cover.

The first step in construction is the frame, made of two oak stringers, 1"x4" and 62" long. These are joined by separators, as shown in Fig 2, with 2" No. 14 steel screws. The rear piece is molded as shown from 2"x3" fir. A tie rod of ¼" cold rolled steel is threaded and fitted in a slot in the bottom of this rear tie piece to strengthen it.

The nose piece may be of the dimensions shown in Fig. 2, which is sketched as a suggestion as to how to handle this part. This nose piece can be cast, or it may be built up of 10 gauge sheet iron, welded at the seams.

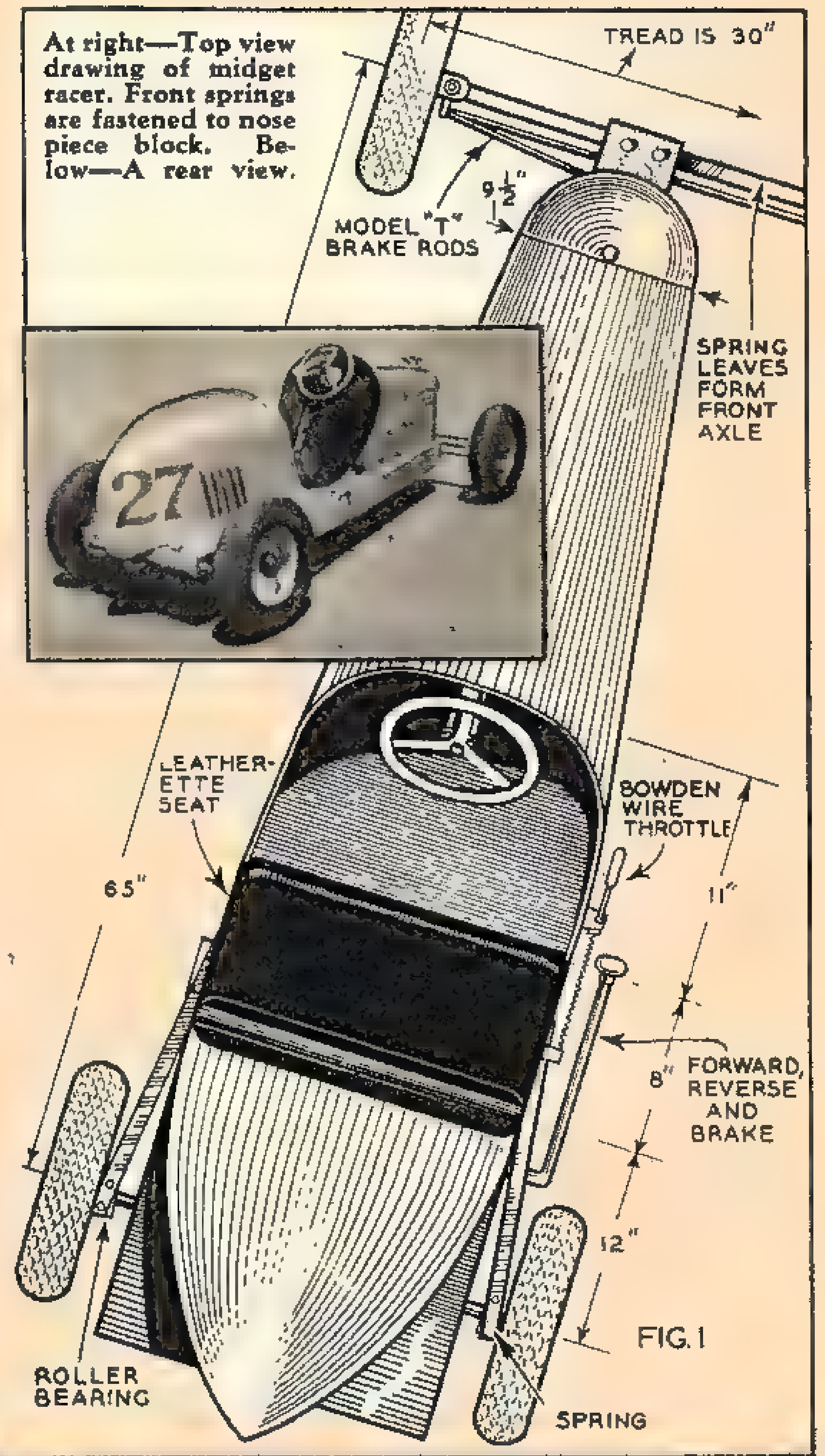
If the nose piece is built up, the spring perch should be an iron or steel block welded and bolted as shown.

A hole for the foot of the steering column is cut in the bottom plate. Steering is done with a Model T steering column given half a revolution so that the foot or dash plate rests on the nose piece instead of the usual dashboard. Holes are drilled into the bottom plate so the dash plate can be fastened with bolts.

The driver's feet and legs go under the front hood. They rest on the 16 gauge metal floor, extending from the front seat support to the nose piece.

The rear axle is one-inch cold rolled steel

[*Continued on page* 126]

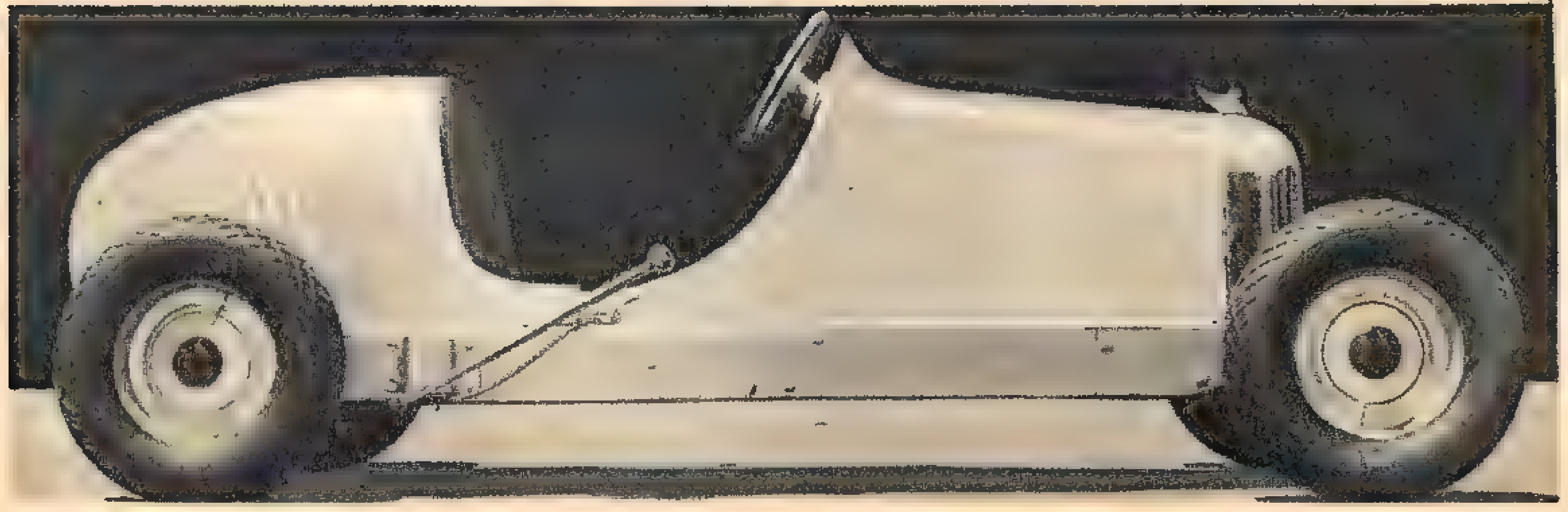


At right—Top view drawing of midget racer. Front springs are fastened to nose piece block. Below—A rear view.

TREAD IS 30"
9½"
MODEL "T" BRAKE RODS
SPRING LEAVES FORM FRONT AXLE
27
LEATHER-ETTE SEAT
BOWDEN WIRE THROTTLE
65"
11"
8"
FORWARD, REVERSE AND BRAKE
12"
ROLLER BEARING
SPRING

FIG. 1

Below—A side view of the "Miller Midget" racer. Balloon tires come with the wheels. The gear shift is a simple arrangement of pulleys and sliding motor block at rear.



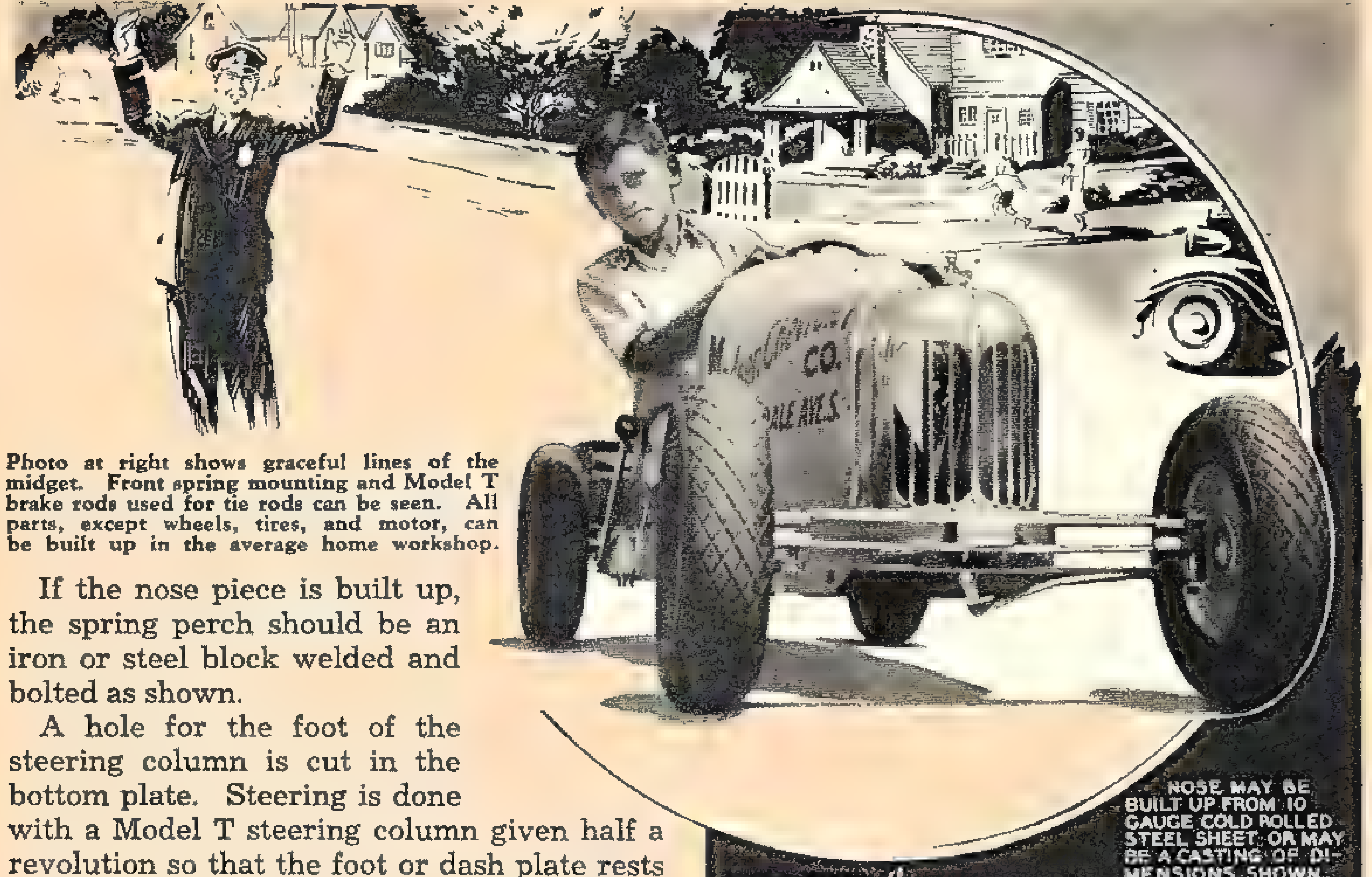
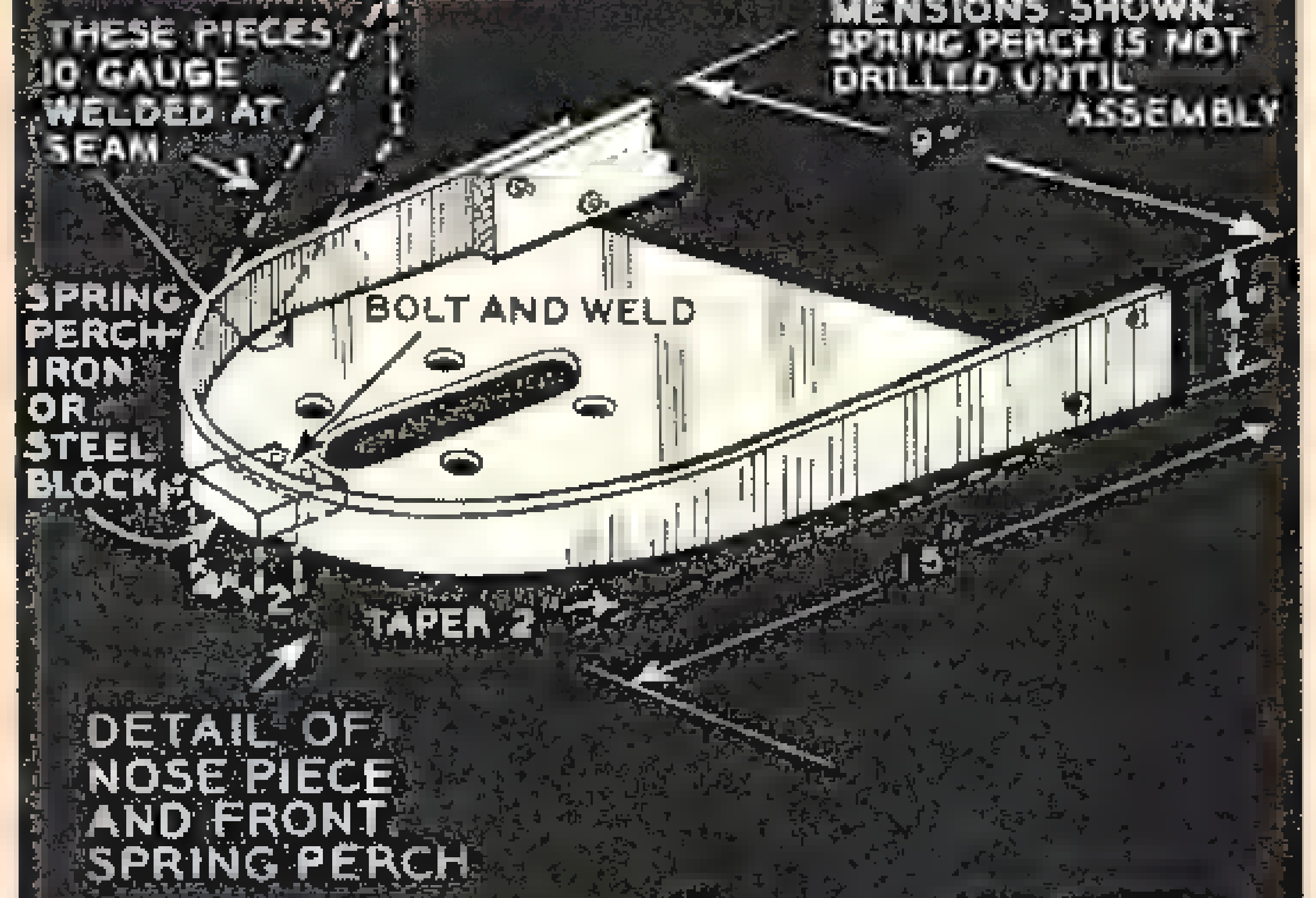


Photo at right shows graceful lines of the midget. Front spring mounting and Model T brake rods used for tie rods can be seen. All parts, except wheels, tires, and motor, can be built up in the average home workshop.

Construction of the frame and nose piece, shown here, is not difficult. Spring perch must be iron or steel for safety. Model T steering column goes through long hole in nose piece bottom. Drill 2" holes for 1" steel rod rear axle.



NOSE MAY BE BUILT UP FROM 10 GAUGE COLD ROLLED STEEL SHEET, OR MAY BE A CASTING OF DIMENSIONS SHOWN. SPRING PERCH IS NOT DRILLED UNTIL ASSEMBLY
THESE PIECES 10 GAUGE WELDED AT SEAM
9"
4"
BOLT AND WELD
SPRING PERCH-IRON OR STEEL BLOCK
15"
2
TAPER 2"

DETAIL OF NOSE PIECE AND FRONT SPRING PERCH

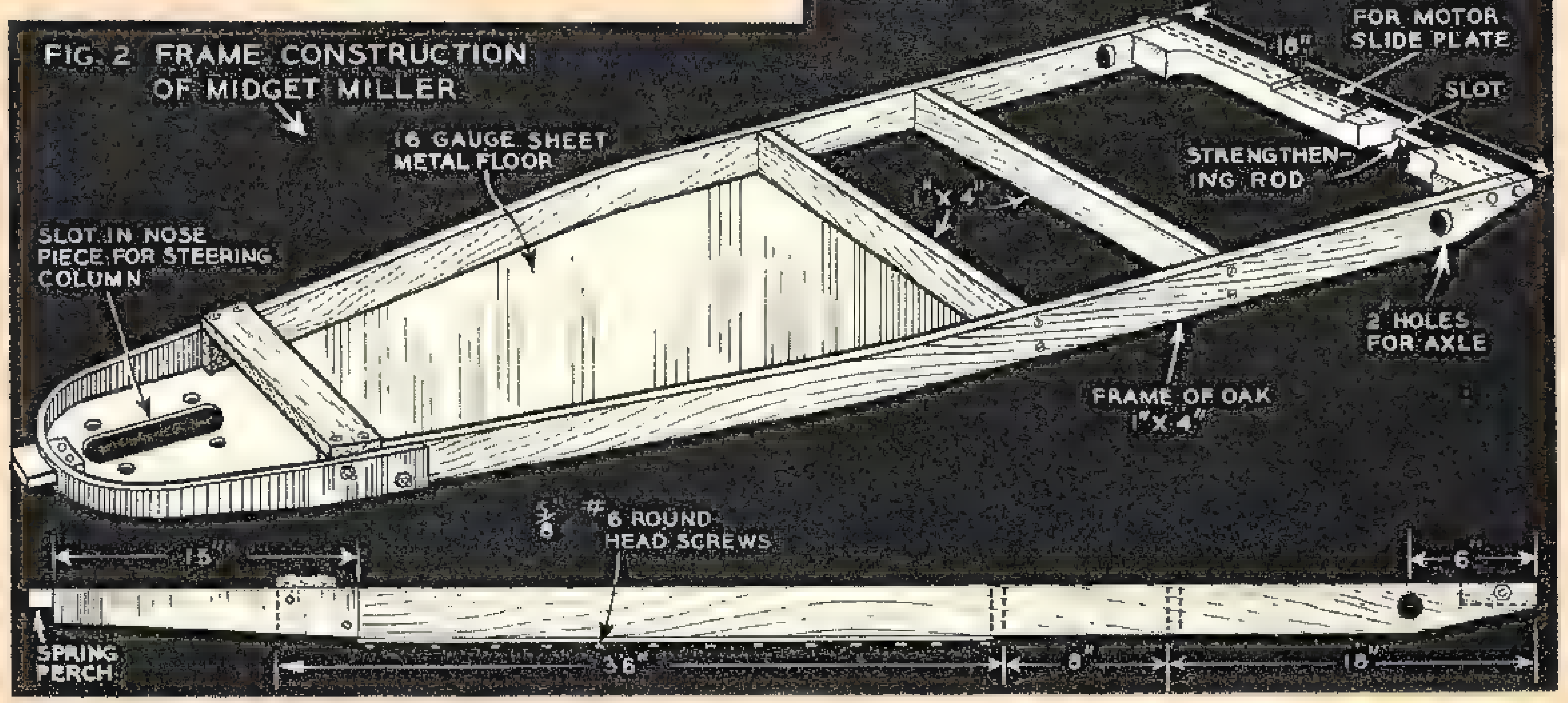


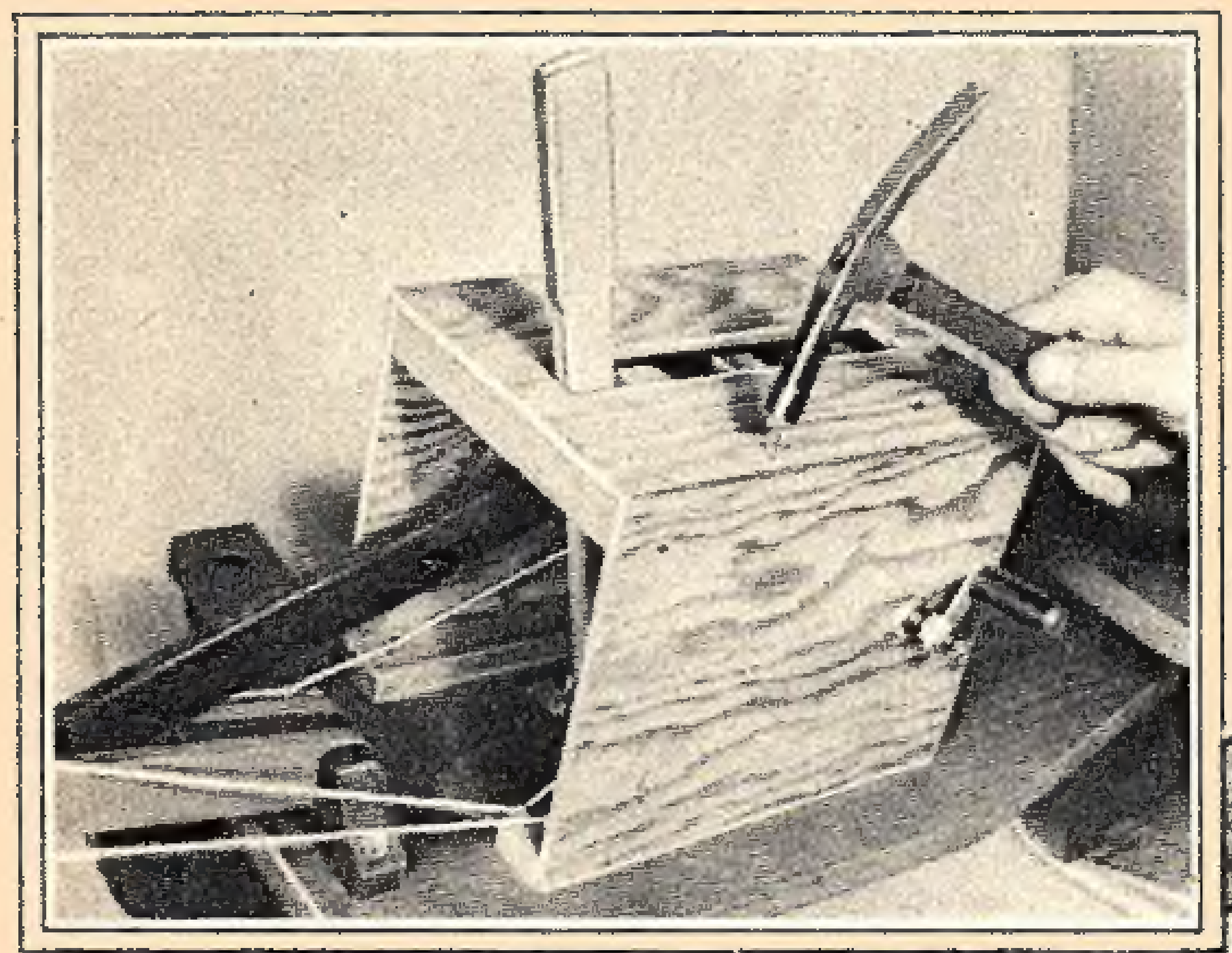
FIG. 2 FRAME CONSTRUCTION OF MIDGET MILLER

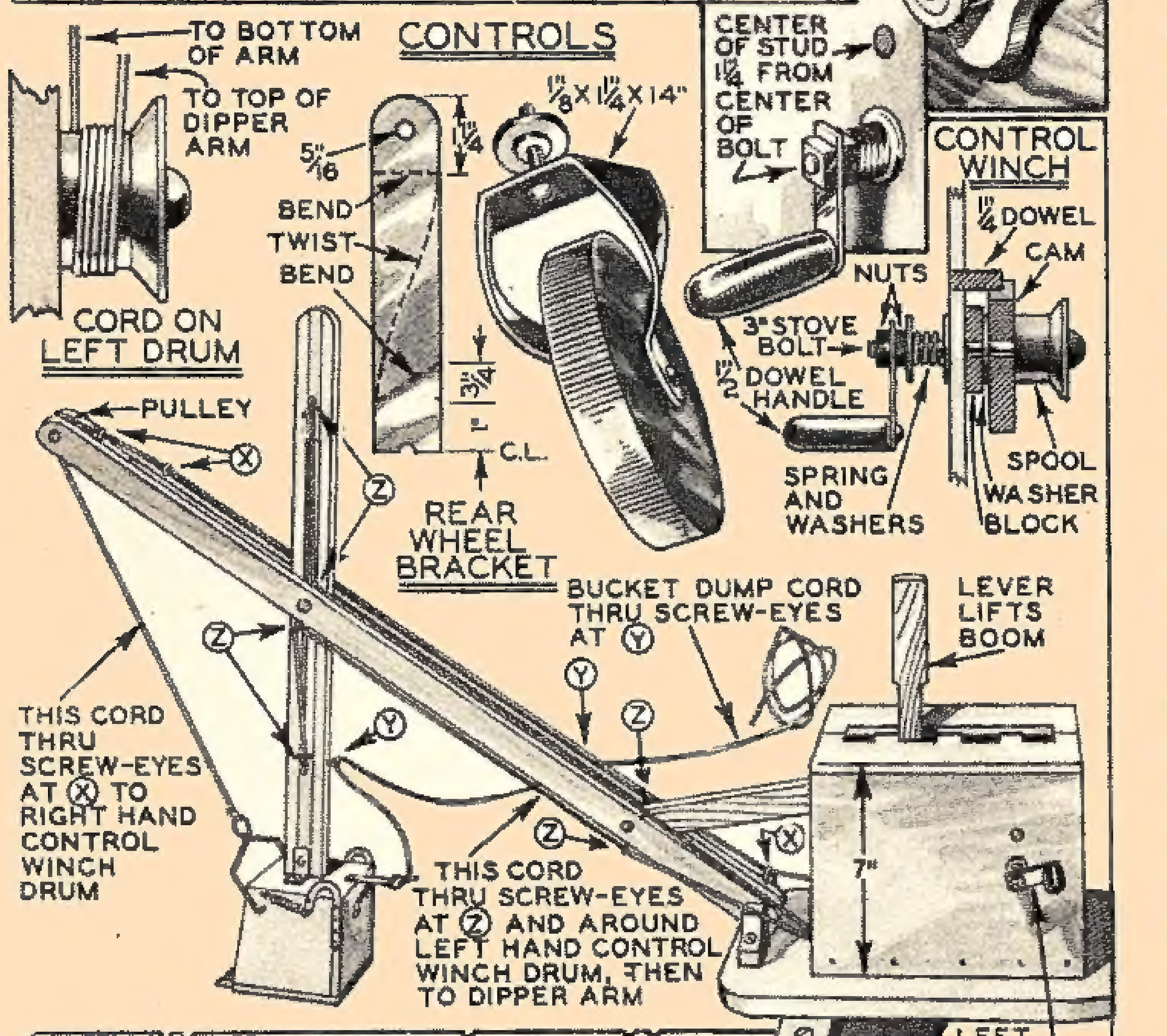
16"
FOR MOTOR SLIDE PLATE
SLOT
16 GAUGE SHEET METAL FLOOR
STRENGTHEN-ING ROD
1"X4"
SLOT IN NOSE PIECE FOR STEERING COLUMN
2" HOLES FOR AXLE
FRAME OF OAK 1"X4"
⅝ #6 ROUND HEAD SCREWS
15"
6"
SPRING PERCH
36"
8"
18"

Boy-Power "STEAM SHOVEL" Moves Miniature MOUNTAINS

Shoveling sand in summer, snow in winter, this boy-size "steam shovel" is a year 'round source of fun for the mechanically inclined youngster who craves action.

by RALPH T. MOORE




TO BOTTOM OF ARM
TO TOP OF DIPPER ARM
CORD ON LEFT DRUM
CONTROLS
1/8 X 1 1/4 X 14"
5/16
1 1/4
BEND
TWIST
BEND
3/4
1"
C.L.
REAR WHEEL BRACKET
CENTER OF STUD 1 1/4 FROM CENTER OF BOLT
CONTROL WINCH
1/4 DOWEL
CAM
NUTS
3" STOVE BOLT
1/2 DOWEL HANDLE
SPRING AND WASHERS
SPOOL
WASHER
BLOCK
PULLEY
Ⓧ
Ⓩ
Ⓨ
BUCKET DUMP CORD THRU SCREW-EYES AT Ⓨ
LEVER LIFTS BOOM
THIS CORD THRU SCREW-EYES AT Ⓧ TO RIGHT HAND CONTROL WINCH DRUM
THIS CORD THRU SCREW-EYES AT Ⓩ AND AROUND LEFT HAND CONTROL WINCH DRUM, THEN TO DIPPER ARM
7"
LEFT CONTROL

LIKE the giant steam shovels used in cutting out highways, this boy-powered shovel digs into miniature sand mountains, pivots about realistically to release its bucketful of earth over a waiting toy truck or railroad gondola car. Hands and feet of youthful operators must move in coordination as boom and dipper are maneuvered back into position for another "bite" at the back-yard sand pile.

Winter brings no period of rest to this sturdy shovel. Watch the one-thousandth cubic yard capacity dipper scoop up snow from the sidewalk, pile it neatly to one side of the path.

The position of the boom is controlled by the lever at the top of the cab, and may be set at four different heights. The sliding movement of the dipper inside the boom is taken care of by the left control crank, and the forward motion of the bucket by the right crank. Turning is done with the feet, the rear wheel being pivoted.

Plywood, a few scraps of soft pine, some pieces of sheet metal, and a few odds and ends of wire and bolts are the only materials needed in constructing this shovel.

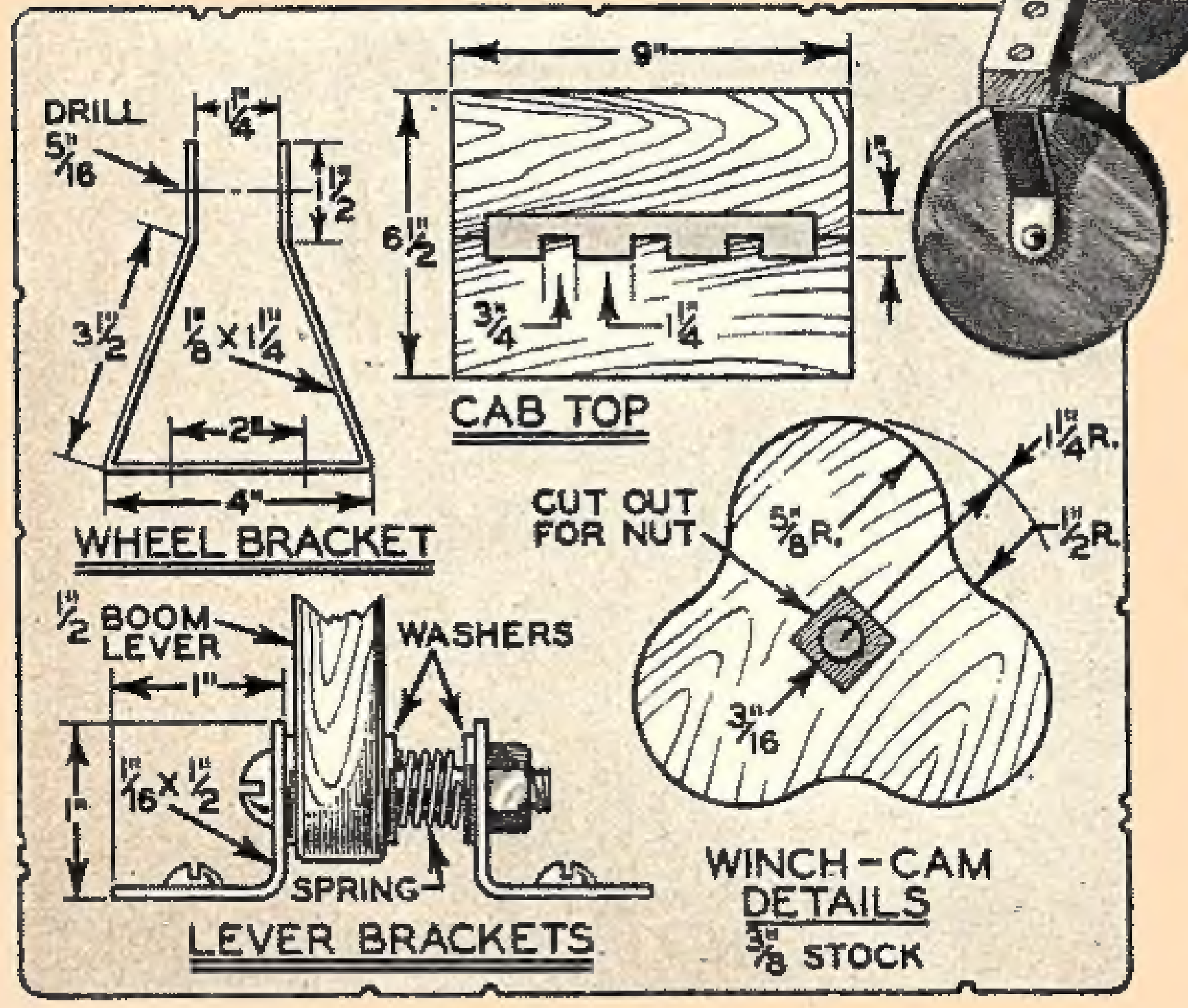
Build the dipper or bucket first, assembling the plywood sides with glue and brads. Cut two hinges for the door from 20-gauge sheet metal, bending as shown in the sketches. The dump lever is cut from the same material, and fastened to the dipper door with small wood screws.

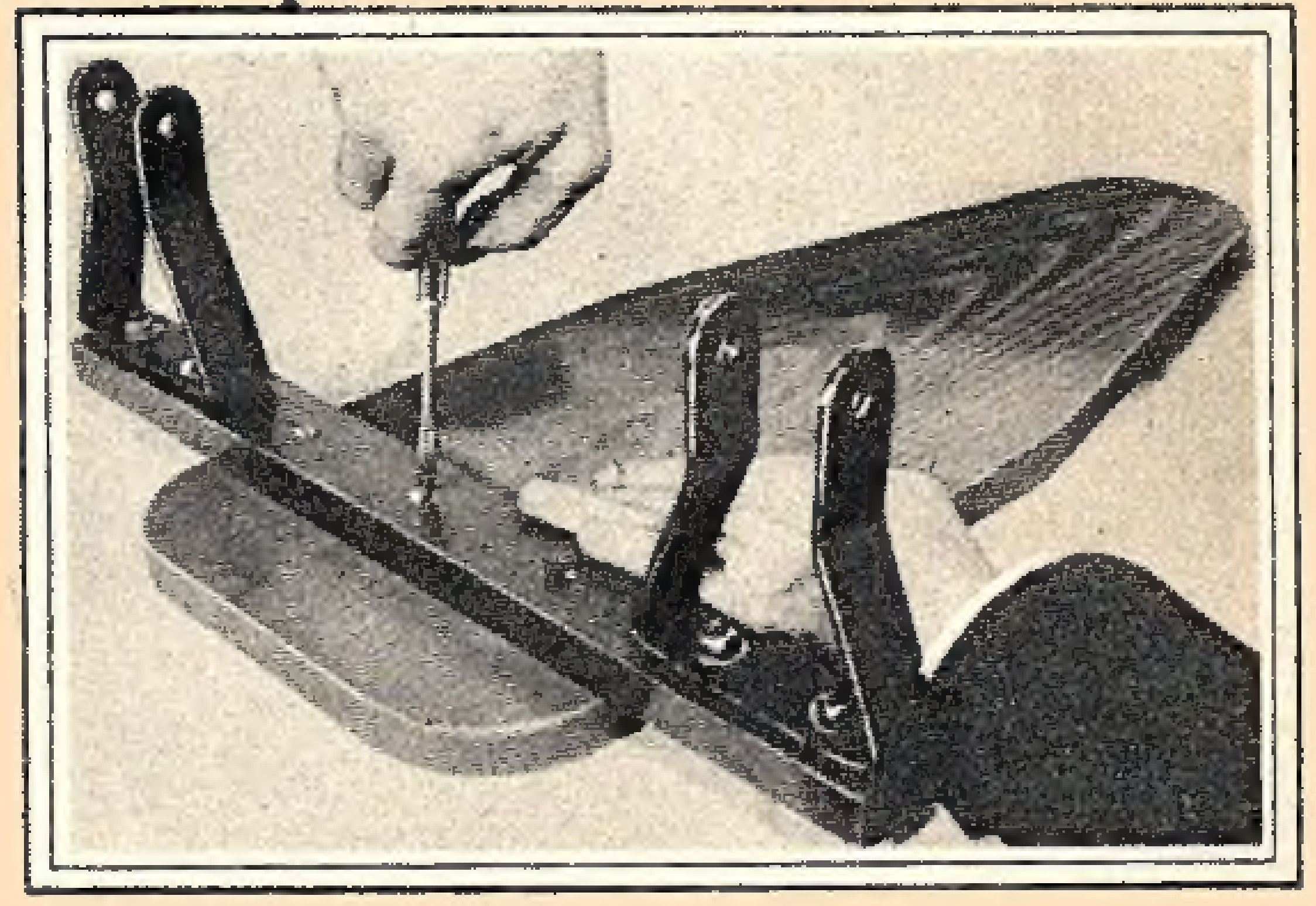
A small spring fastened to the dipper keeps sand from forcing open the bucket door. An 11" length of stiff wire is bent to form the dipper bail; this snaps into place.

Saw out the base board, the seat, and the front wheel bracket arm from 1" stock, sanding the edges and then drilling as shown. The wheels may either be cut from 1¼" stock on the band saw or turned out on a lathe. Wheel brackets are formed from ⅛" thick strap iron.

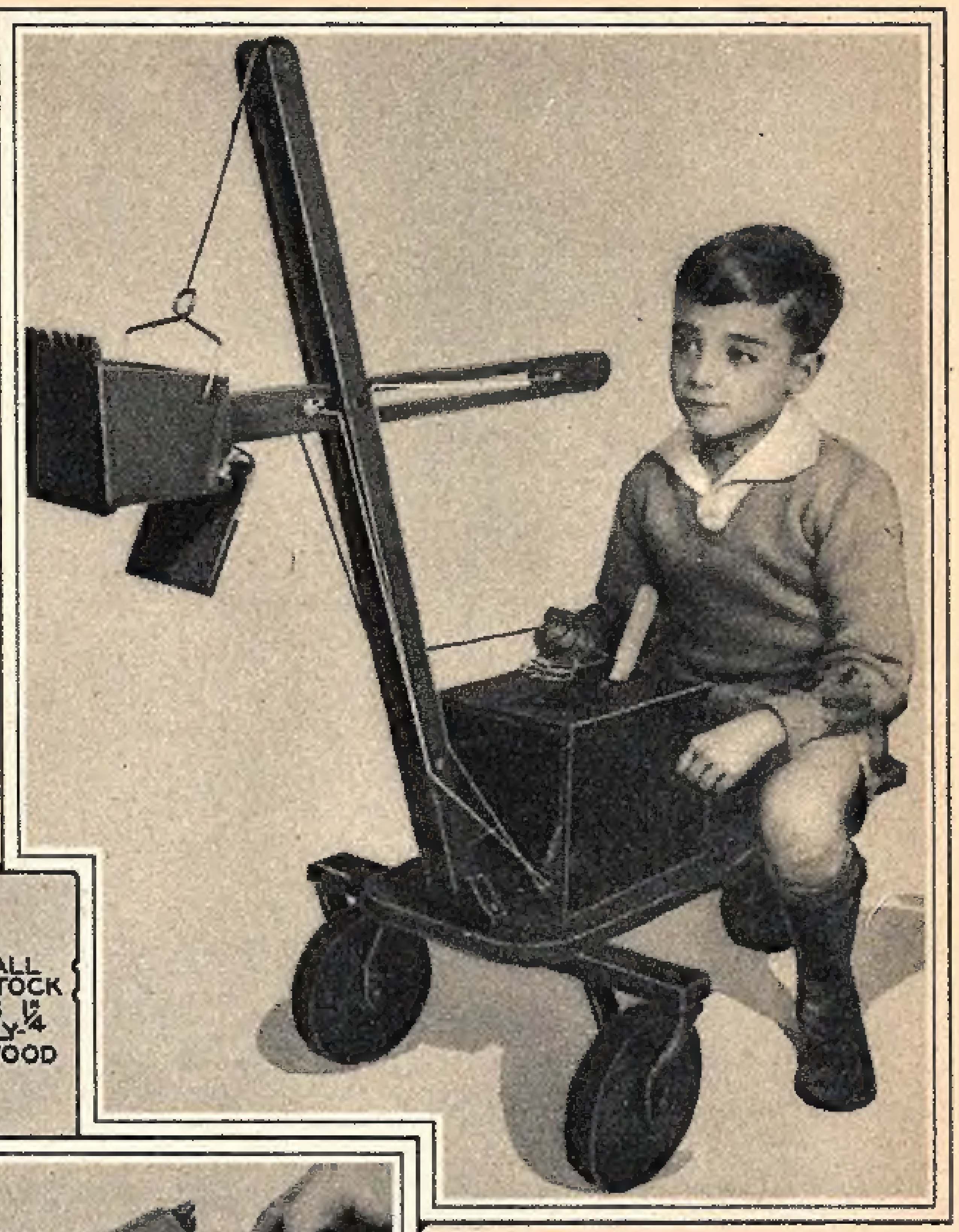
Use strong chalk line in rigging the shovel. Small screw eyes serve as guide pulleys.

Two coats of paint complete the shovel.

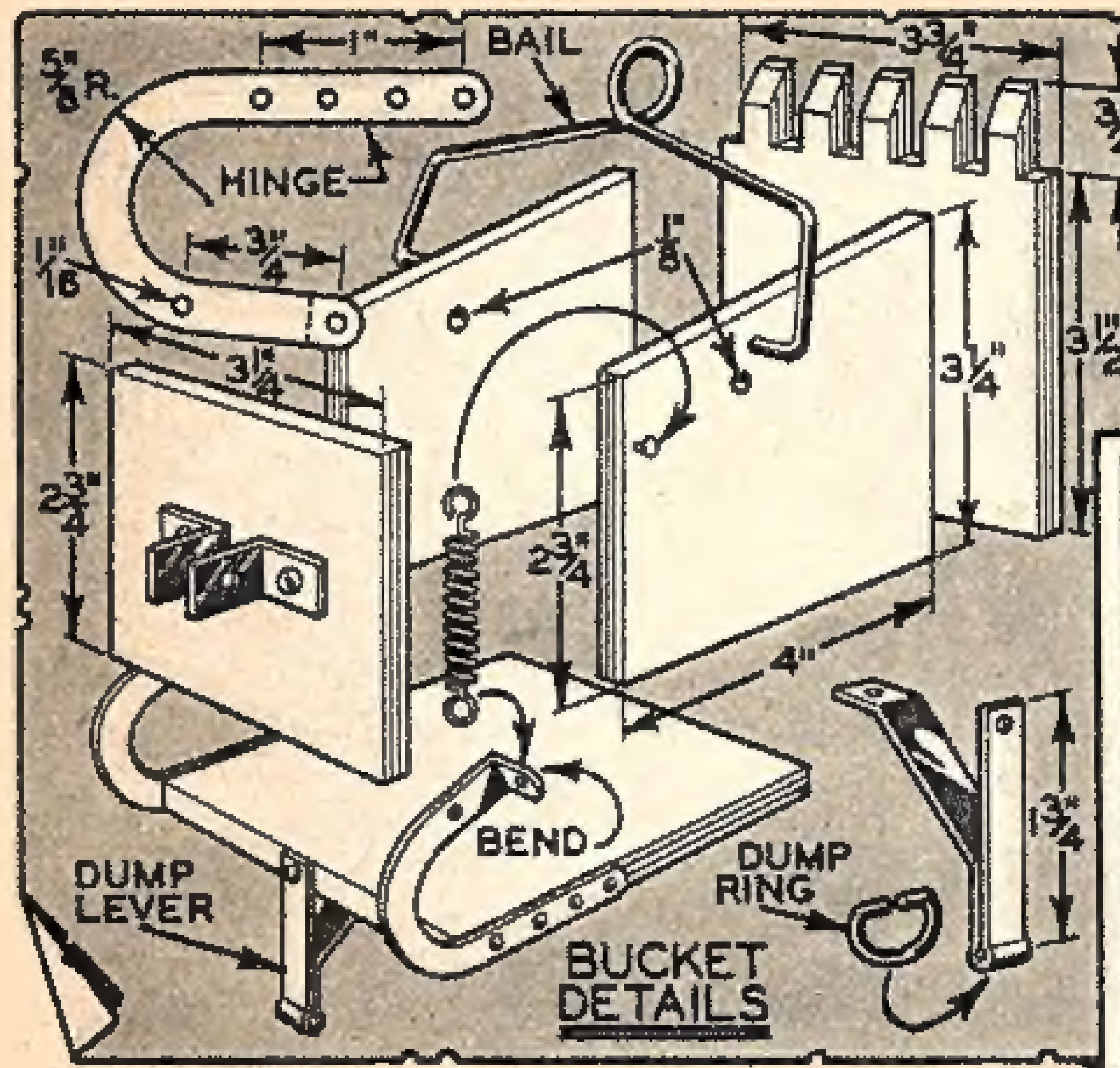

DRILL 5/16
1/4
1 1/2
3 1/2
1/8 X 1 1/4
2"
4"
WHEEL BRACKET
9"
6 1/2
1"
3/4
1 1/4
CAB TOP
1/2 BOOM LEVER
1"
WASHERS
1/16 X 1/2
SPRING
LEVER BRACKETS
CUT OUT FOR NUT
5/8 R.
1 1/4 R.
1/2 R.
3/16
WINCH-CAM DETAILS
3/8 STOCK

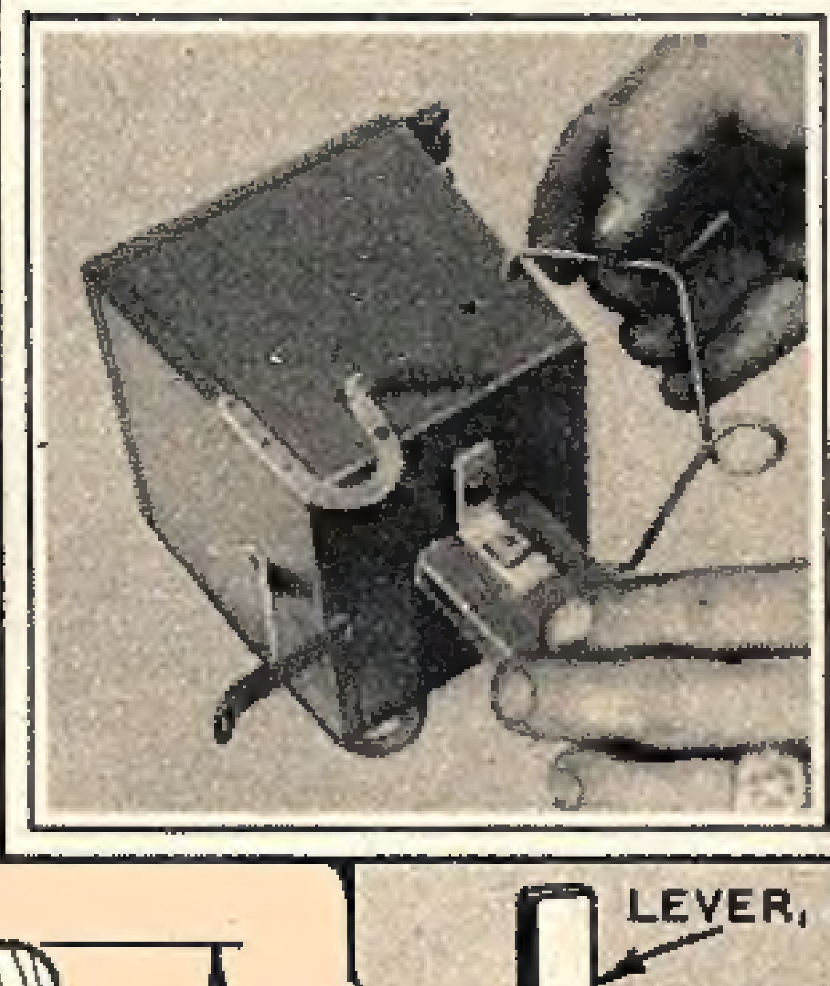


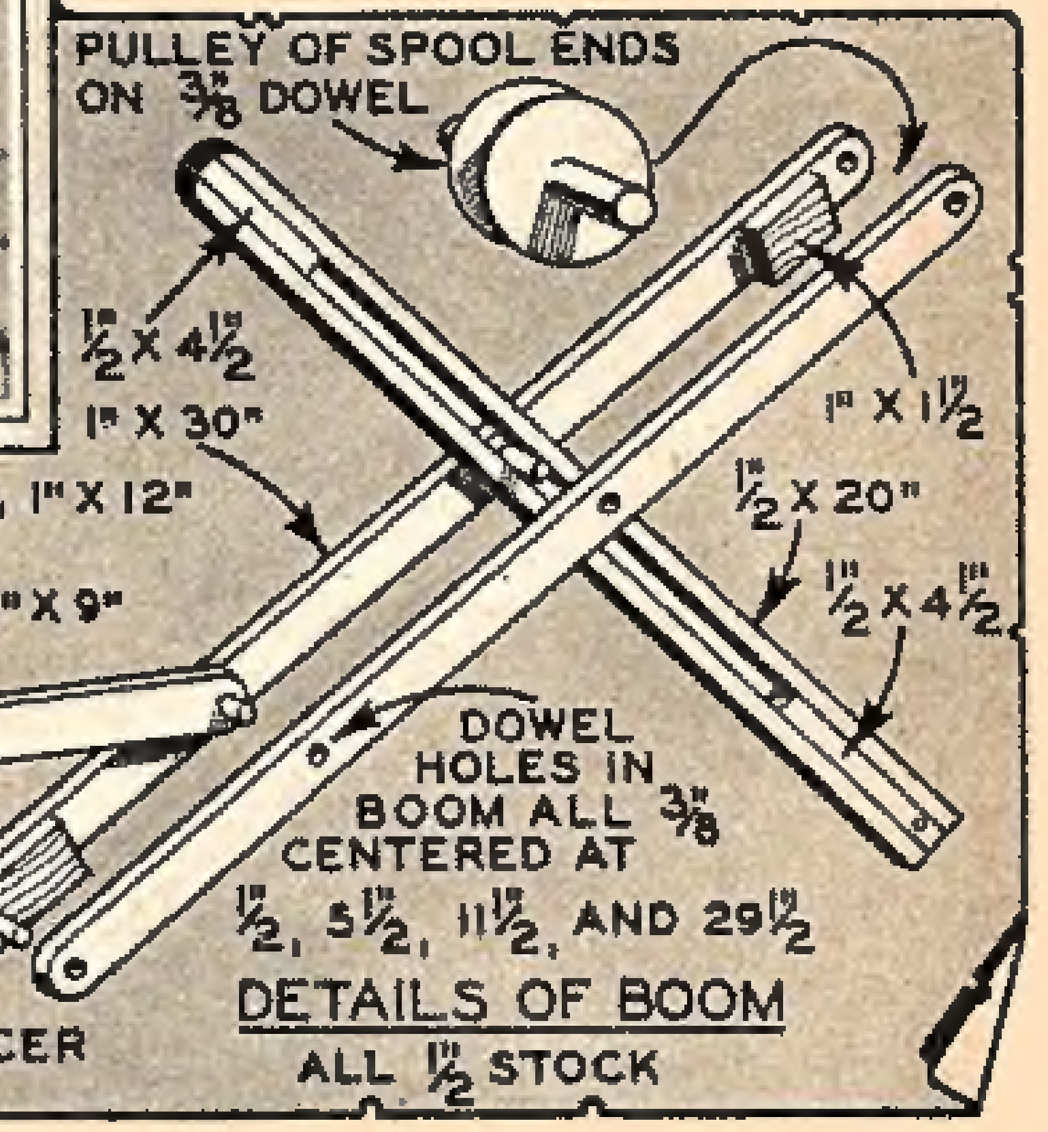
Details of construction and assembly of steam shovel are covered in above sketches and photos. Control winch, on right side of cab, has locking cam which holds up the dipper.

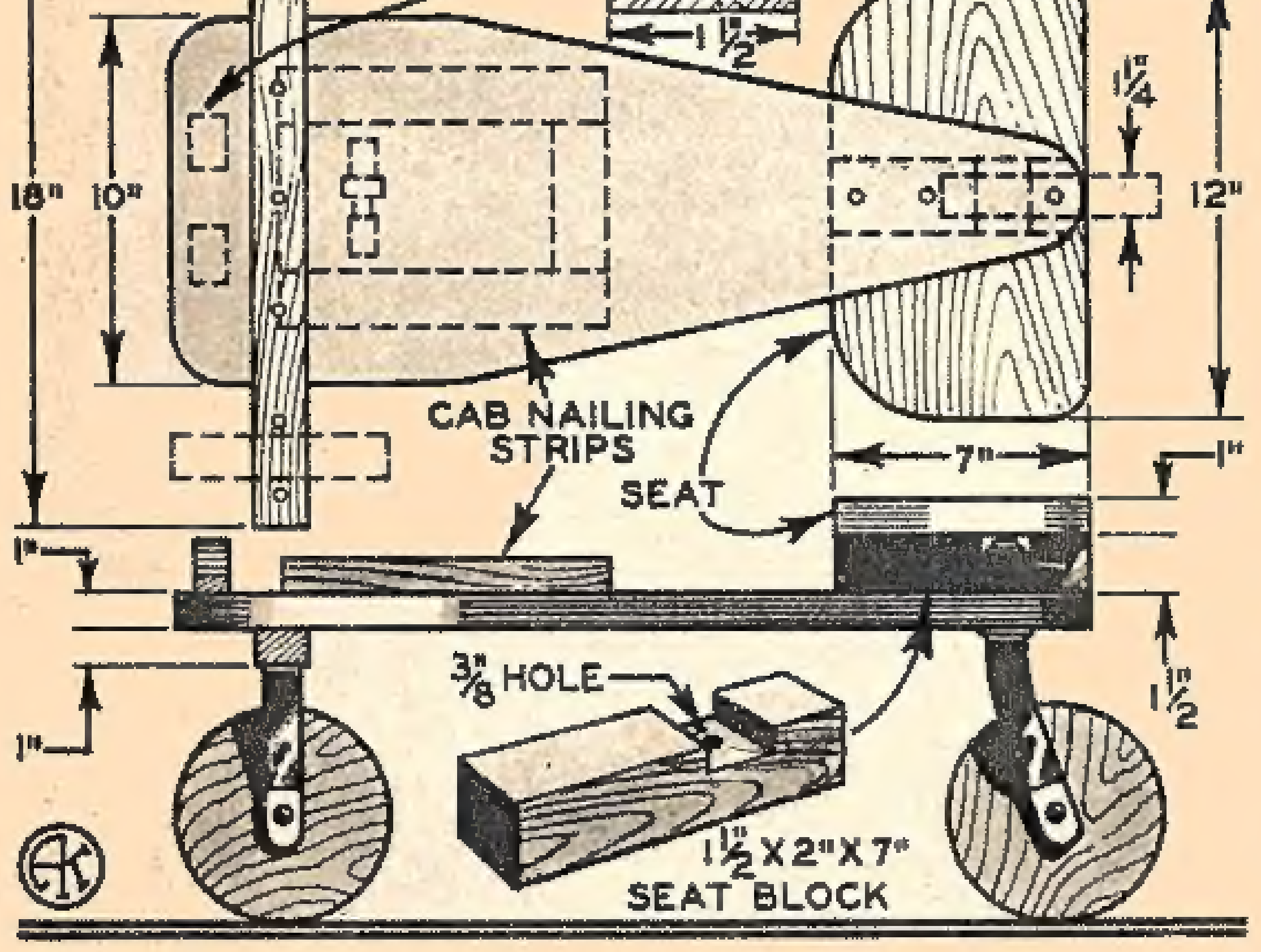


Here's how the completed shovel will appear. Bucket release cord is held in hand. Boom is at highest position here.


5/8 R.
1"
BAIL
HINGE
1/16
3/4
3 1/4
3 3/4
3/4
ALL STOCK IS 1/4 PLY-WOOD
1/8
3 1/2
3 1/4
2 3/4
2 3/4
4"
BEND
DUMP LEVER
DUMP RING
1 3/4
BUCKET DETAILS




PULLEY OF SPOOL ENDS ON 3/8 DOWEL
1/2 X 4 1/2
1" X 30"
1" X 1 1/2
LEVER, 1" X 12"
1/2 X 20"
LINK, 1" X 9"
1/2 X 4 1/2
DOWEL HOLES IN BOOM ALL 3/8 CENTERED AT 1/2, 5 1/2, 11 1/2, AND 29 1/2
4 1/2
3/16
3 1/2 SPACER
DETAILS OF BOOM
ALL 1/2 STOCK


1 1/2
1/8 DRILL
3/8 HOLE 1/4 DEEP
BOOM BLOCK
1 1/2
18"
10"
1 1/4
12"
CAB NAILING STRIPS
SEAT
7"
1"
1"
1"
1 1/2
3/8 HOLE
1 1/2 X 2" X 7"
SEAT BLOCK

Assembly of bucket, base, and boom arm are covered above. Red, black, and grey is suggested combination for the shovel.

Unfolding the Mysteries of BOAT Plans

by **SAM S. RABL**
Naval Architect

To one planning to build his first boat, the plans and specifications of the naval architect are a maze of hieroglyphics—a discouraging stumbling block. This experienced designer here explains how to follow boat-building plans properly.

TO THE seasoned boatbuilder the terms used by a naval architect in describing the design and building of a new boat have a world of meaning; to the beginner they can be as puzzling and incoherent as a foreign language.

Laying down is the term applied to the process of enlarging the small scale drawings of the architect to full size; this must be done before a single timber can be cut for the boat. *Taking off* is the term applied to the transferring the curves and dimensions on this full size plan to the frame timbers of the boat.

Before we go into the mechanics of the actual laying down, an explanation of the terms used in this process will be a great help. The complete set of curves that depict a boat shape is called the *lines.* The lines plan is usually divided into three views. The *profile* depicts the shape of the boat as we see her from the side in normal position.

The *plan* is really a "fish-eye view," showing how the boat appears when looking at her from a point directly beneath her keel.

The *body plan* shows the boat as she would appear if we were to look directly at the ends. This plan is usually drawn with the forward frames on one side of the center and the after frames on the other. The two sides of the hull are seldom drawn, as the shape is supposed to be symmetrical. The lines which represent the frame or mould positions are known as the *frame lines* or *station lines.* Examples of each view are shown in the sketches accompanying this article.

All vertical dimensions on a boat are usually

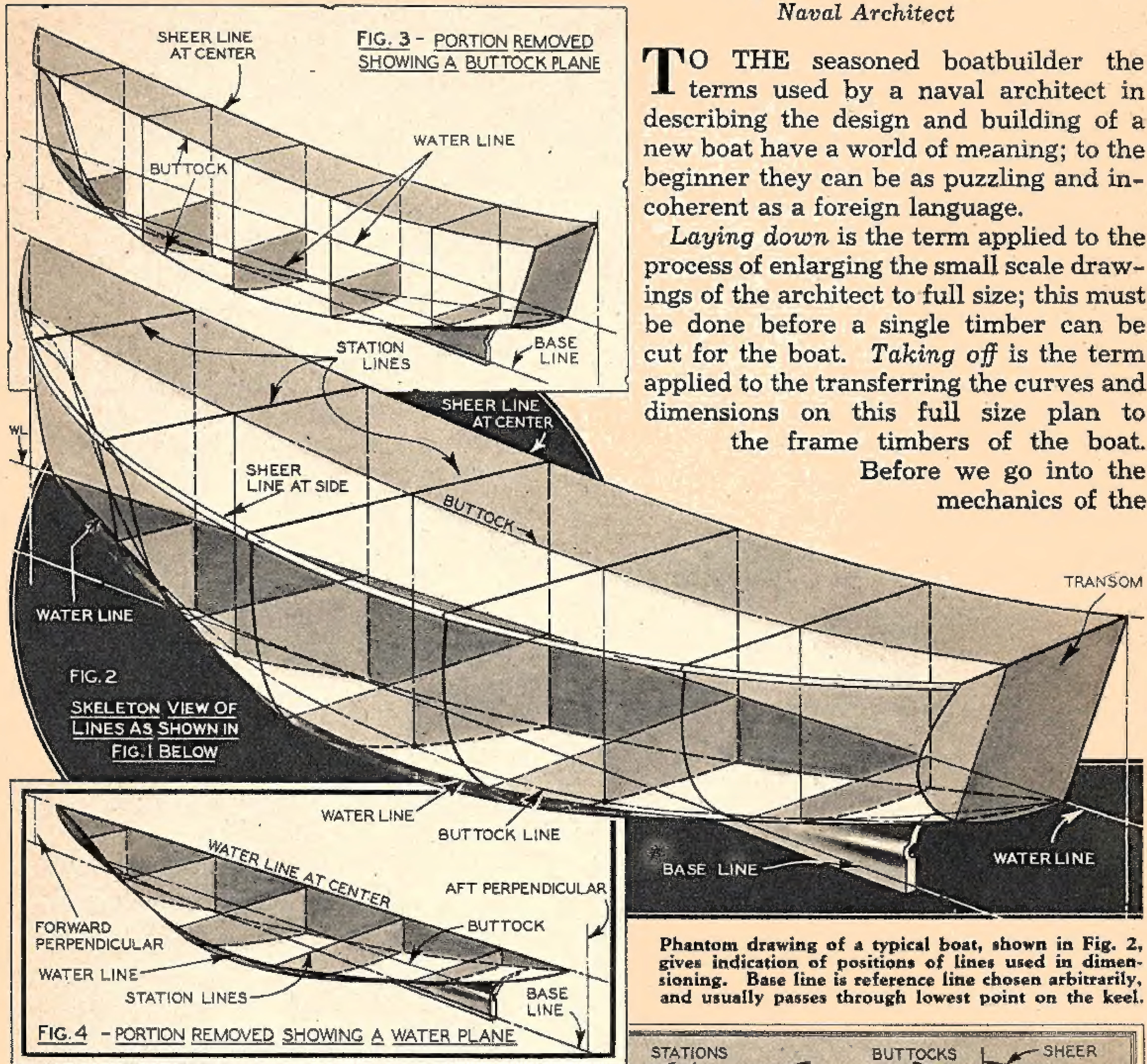

SHEER LINE AT CENTER
BUTTOCK
WATER LINE
STATION LINES
BASE LINE
SHEER LINE AT CENTER
WL
SHEER LINE AT SIDE
BUTTOCK
TRANSOM
WATER LINE
BASE LINE
WATER LINE
WATER LINE
BUTTOCK LINE
WATER LINE AT CENTER
AFT PERPENDICULAR
FORWARD PERPENDICULAR
BUTTOCK
WATER LINE
STATION LINES
BASE LINE

FIG. 3 - PORTION REMOVED SHOWING A BUTTOCK PLANE

FIG. 2 SKELETON VIEW OF LINES AS SHOWN IN FIG. 1 BELOW

FIG. 4 - PORTION REMOVED SHOWING A WATER PLANE

Phantom drawing of a typical boat, shown in Fig. 2, gives indication of positions of lines used in dimensioning. Base line is reference line chosen arbitrarily, and usually passes through lowest point on the keel.

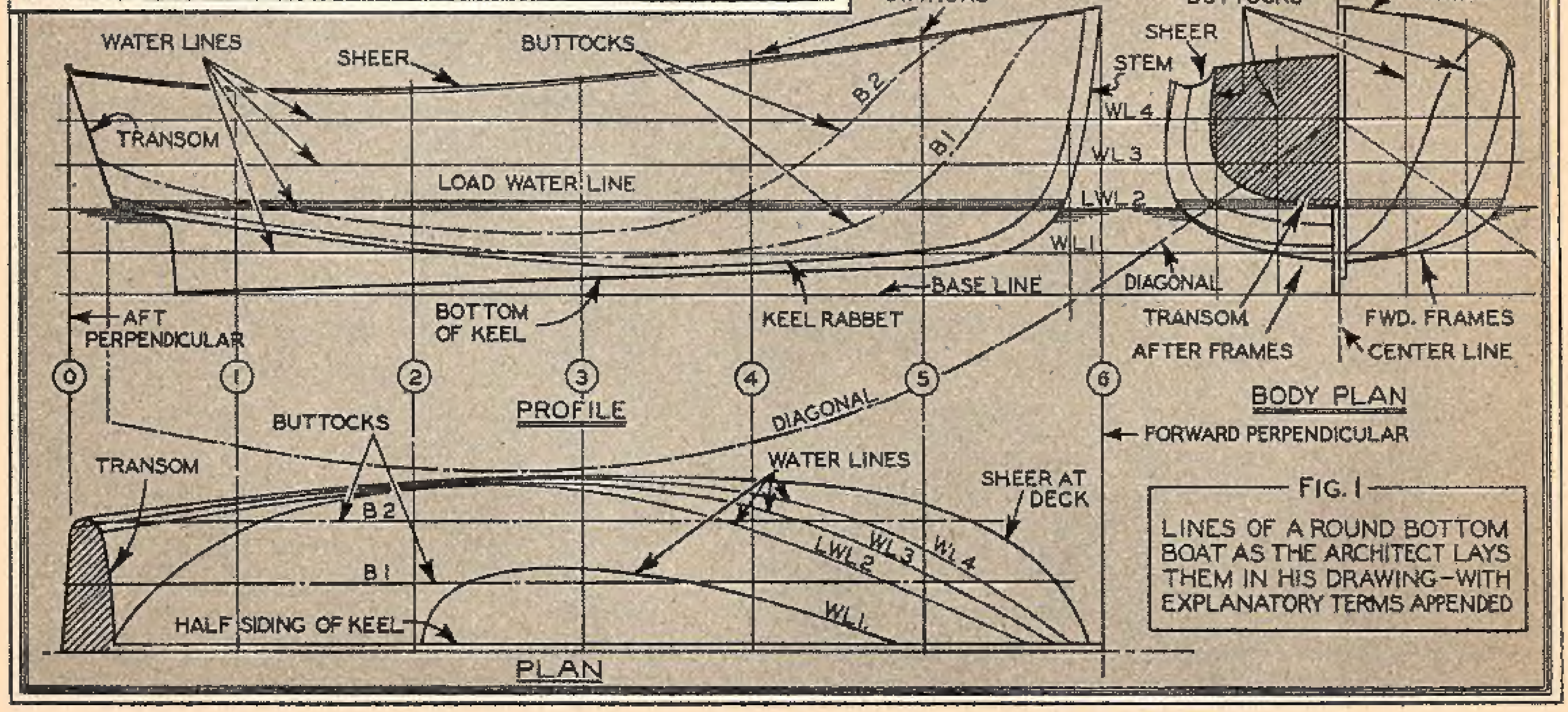
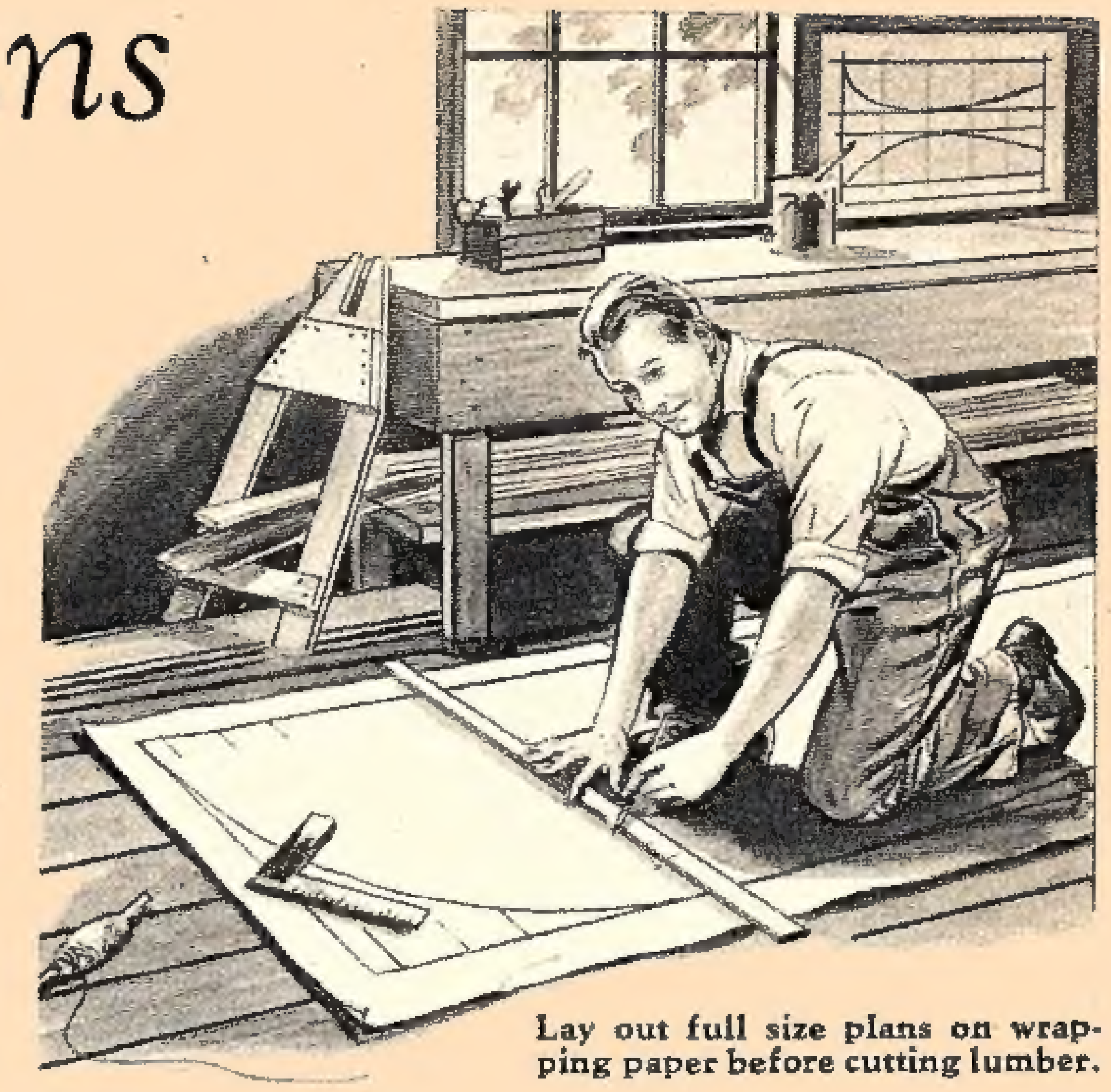

STATIONS
BUTTOCKS
SHEER
WATER LINES
SHEER
BUTTOCKS
B2
B1
SHEER
STEM
WL 4
WL 3
TRANSOM
LOAD WATER LINE
LWL 2
WL 1
BASE LINE
DIAGONAL
AFT PERPENDICULAR
BOTTOM OF KEEL
KEEL RABBET
TRANSOM
AFTER FRAMES
FWD. FRAMES
CENTER LINE
0
1
2
3
4
5
6
PROFILE
BODY PLAN
DIAGONAL
FORWARD PERPENDICULAR
BUTTOCKS
TRANSOM
WATER LINES
SHEER AT DECK
B2
B1
LWL 2
WL 3
WL 4
WL 1
HALF SIDING OF KEEL
PLAN

FIG. 1 LINES OF A ROUND BOTTOM BOAT AS THE ARCHITECT LAYS THEM IN HIS DRAWING—WITH EXPLANATORY TERMS APPENDED

These three views—profile, body, and plan, are sufficient when accompanied by table of offsets, to give all information needed by experienced boat builder. In process of "laying down" these views are enlarged to full size on shop floor.



Lay out full size plans on wrapping paper before cutting lumber.

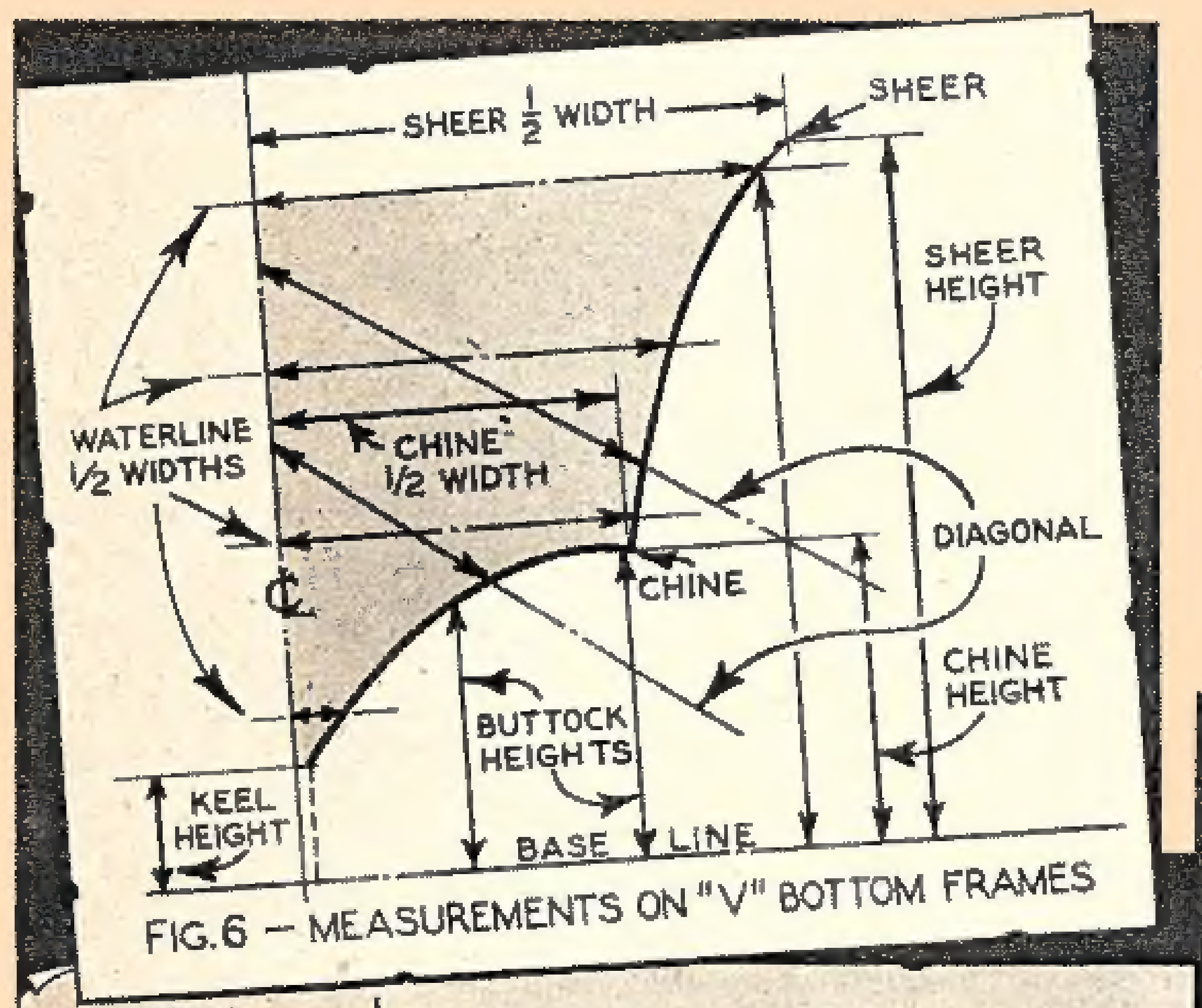
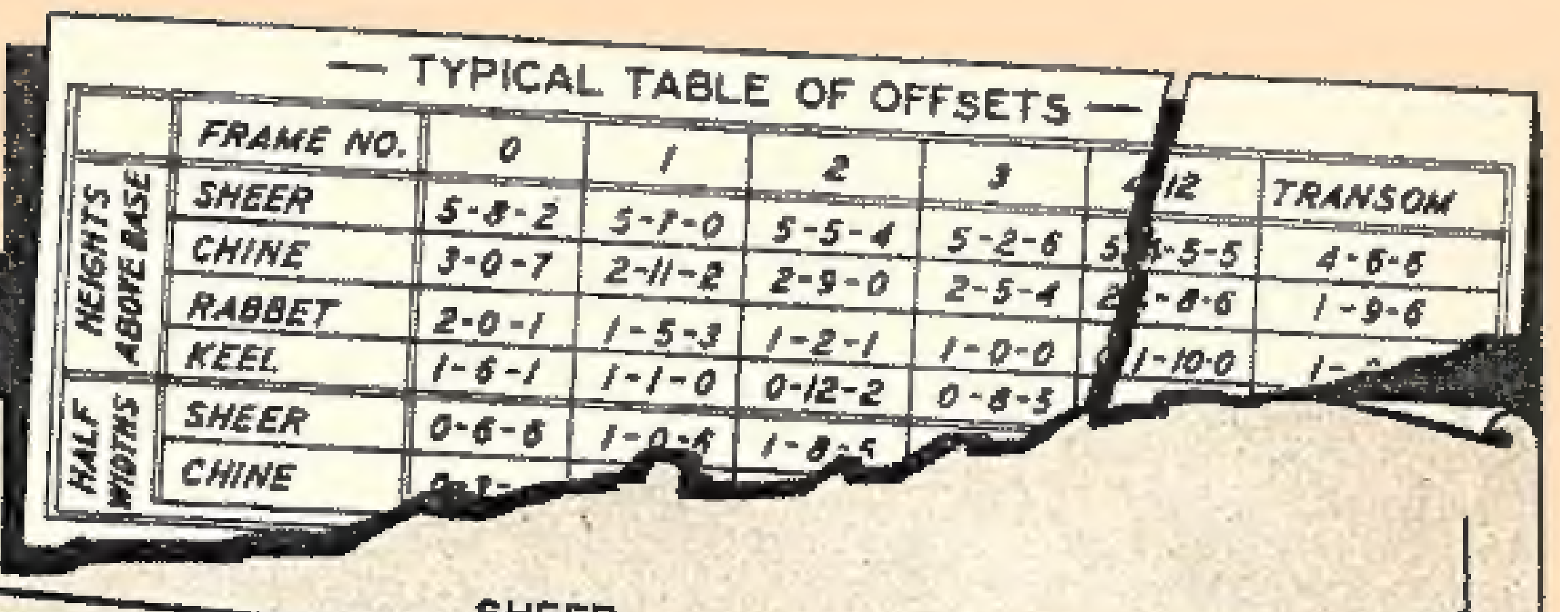

SHEER ½ WIDTH
SHEER
SHEER HEIGHT
WATERLINE ½ WIDTHS
CHINE ½ WIDTH
DIAGONAL
℄
CHINE
CHINE HEIGHT
BUTTOCK HEIGHTS
KEEL HEIGHT
BASE LINE

FIG. 6 — MEASUREMENTS ON "V" BOTTOM FRAMES



— TYPICAL TABLE OF OFFSETS —

	FRAME NO.	0	1	2	3	4	12	TRANSOM
HEIGHTS ABOVE BASE	SHEER	5-8-2	5-7-0	5-5-4	5-2-6	5	-5-5	4-6-6
	CHINE	3-0-7	2-11-2	2-9-0	2-5-4	2	-8-6	1-9-6
	RABBET	2-0-1	1-5-3	1-2-1	1-0-0		1-10-0	1-
	KEEL	1-6-1	1-1-0	0-12-2	0-8-5			
HALF WIDTHS	SHEER	0-6-6	1-0-6	1-8-5				
	CHINE	0-						

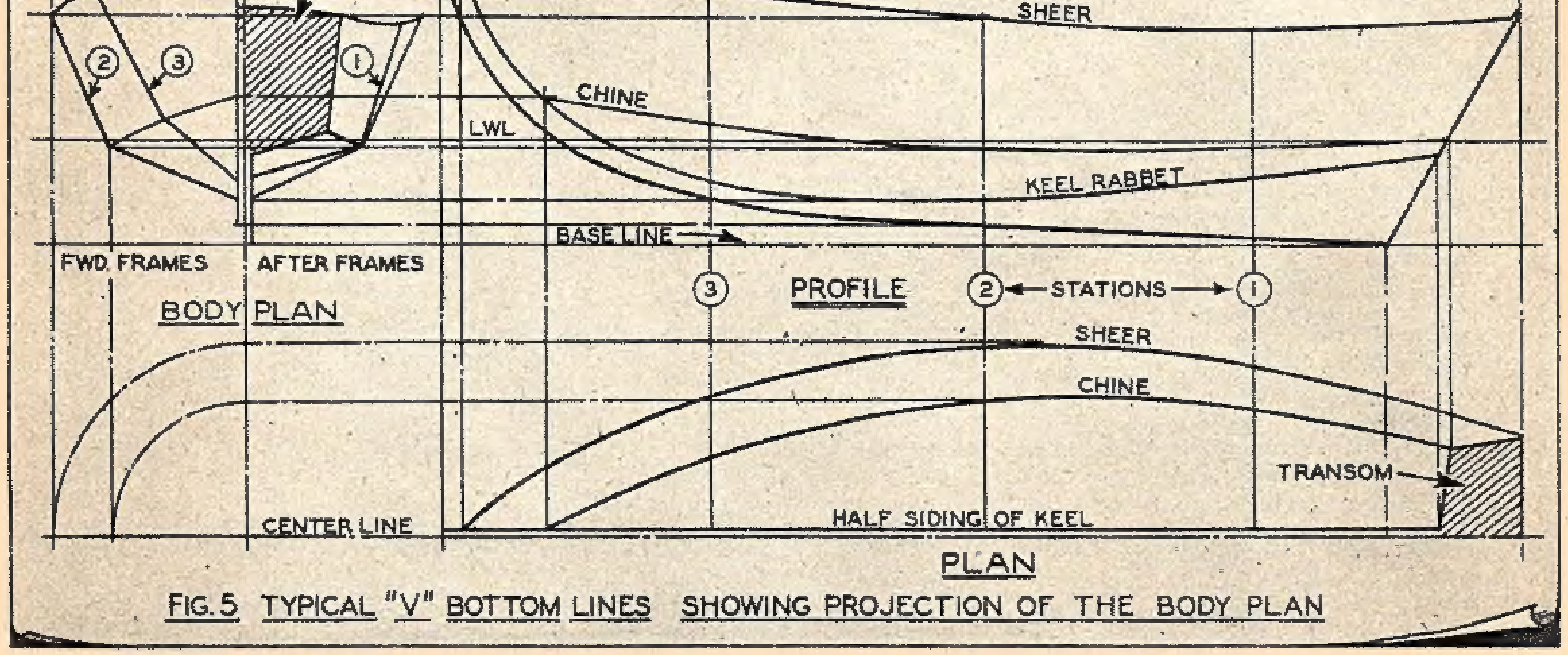

SHEER
TRANSOM
2
3
1
SHEER
CHINE
LWL
KEEL RABBET
BASE LINE
FWD. FRAMES
AFTER FRAMES
BODY PLAN
3
PROFILE
2
STATIONS
1
SHEER
CHINE
TRANSOM
CENTER LINE
HALF SIDING OF KEEL
PLAN

FIG. 5 TYPICAL "V" BOTTOM LINES SHOWING PROJECTION OF THE BODY PLAN

V-bottom boats offer slightly different building problems from round-bottom craft, but three views are still sufficient to represent the boat. Typical table of offsets, giving dimensions with reference to the base line and center line at different stations, is shown above. Dimensions are given in feet, inches, and eighths. 5-8-2 is then 5', 8¼". Meanings of sheer and chine are shown in Fig. 6, above. LWL is low waterline, where the boat should float when empty. Base line is reference line.

Make Projections from Full-Size Plans to Check Fairness of Lines

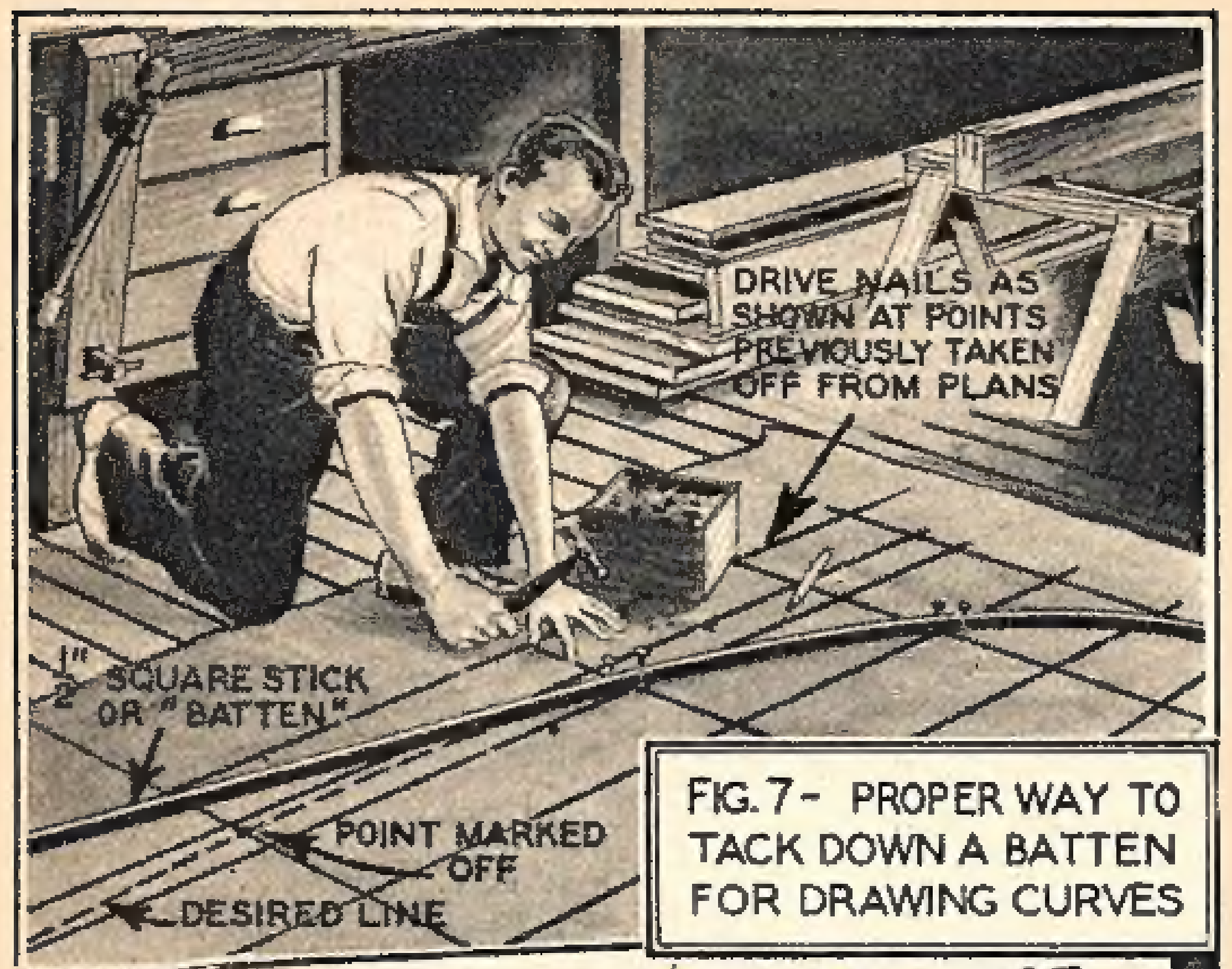

DRIVE NAILS AS SHOWN AT POINTS PREVIOUSLY TAKEN OFF FROM PLANS
1/2" SQUARE STICK OR "BATTEN"
POINT MARKED OFF
DESIRED LINE

FIG. 7 - PROPER WAY TO TACK DOWN A BATTEN FOR DRAWING CURVES

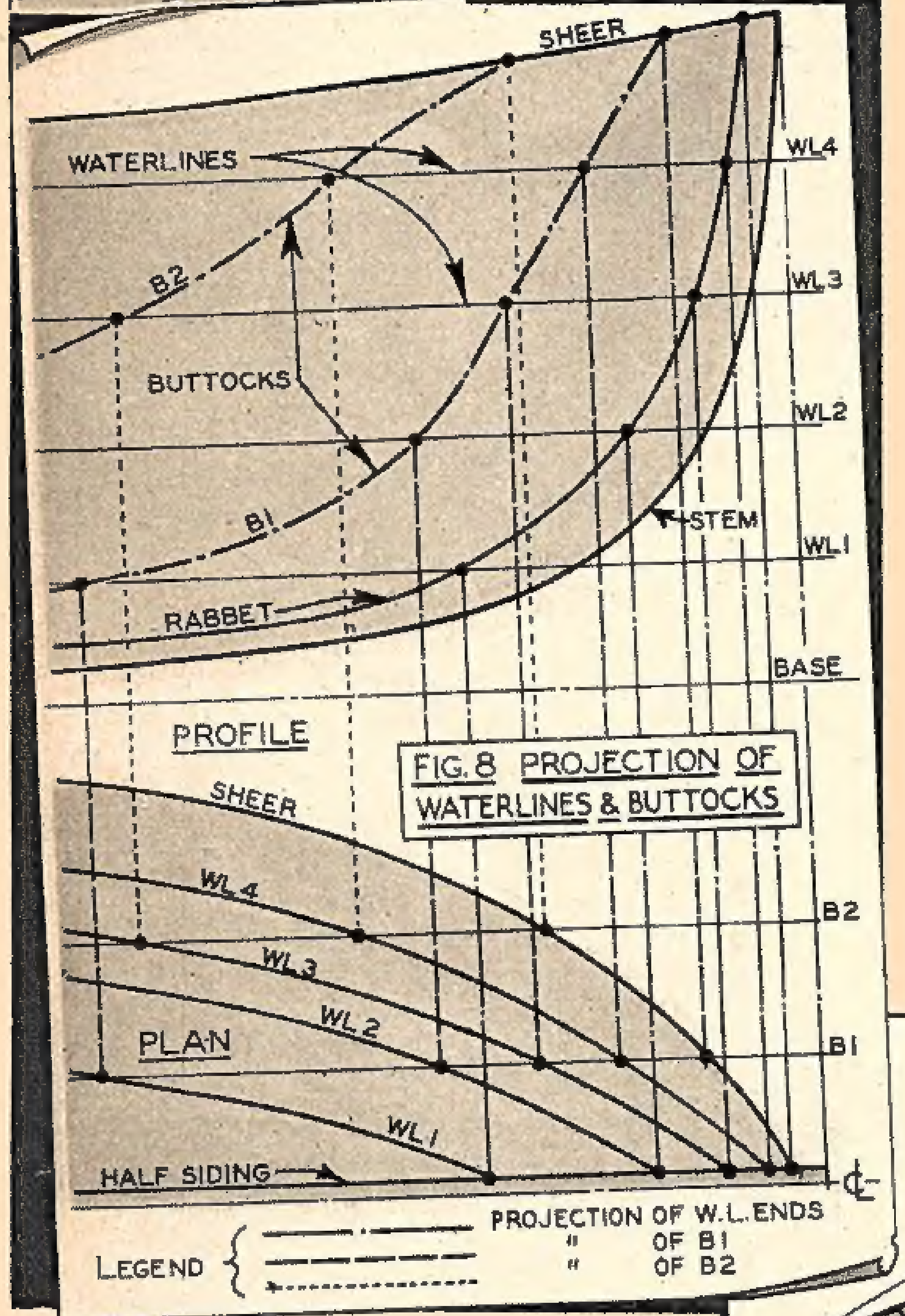

SHEER
WATERLINES
WL 4
WL 3
WL 2
WL 1
B2
BUTTOCKS
B1
STEM
RABBET
BASE
PROFILE
SHEER
WL 4
WL 3
WL 2
PLAN
WL 1
B2
B1
HALF SIDING
℄
LEGEND
PROJECTION OF W.L. ENDS
" OF B1
" OF B2

FIG. 8 PROJECTION OF WATERLINES & BUTTOCKS

given with reference to the *base line*, an arbitrarily chosen line passing the length of the boat just under the keel or lowest point. On plan views the projection of the *base line* is always known as the *center line.*

Any horizontal cut through the hull parallel to the base line forms a plane which would be called a *waterline* if we were referring to its boundary or a *waterplane* if we refer to the entire plane. If on the other hand we were to make a cut through the hull in a vertical plane parallel to its centerline we would form a *buttock* and buttockplane or *vertical plane.* In some old books we may find what we term the buttocks today divided into two classes of lines. The forward portions were termed the bow lines, and those at the stern end buttocks.

A diagonal cut through the hull lengthwise with one edge parallel to the centerline is termed a *diagonal;* this type of line is often used to give measurements which, because of curves in the hull, would be inconvenient to give on either waterlines or buttocks.

In the preliminary examination of a set of lines a good rule to remember is "Waterlines always appear as *straight* lines in the profile and as *curved* lines in the plan. Buttocks always appear as *curved* lines in the profile and as *straight* lines in the plan. Station lines appear as *straight* lines in both profile and plan. Waterlines and buttocks as well as diagonals appear as *straight* lines in the body plan while station lines will appear *curved.*"

These "laying down" methods are used for round bottom hulls.

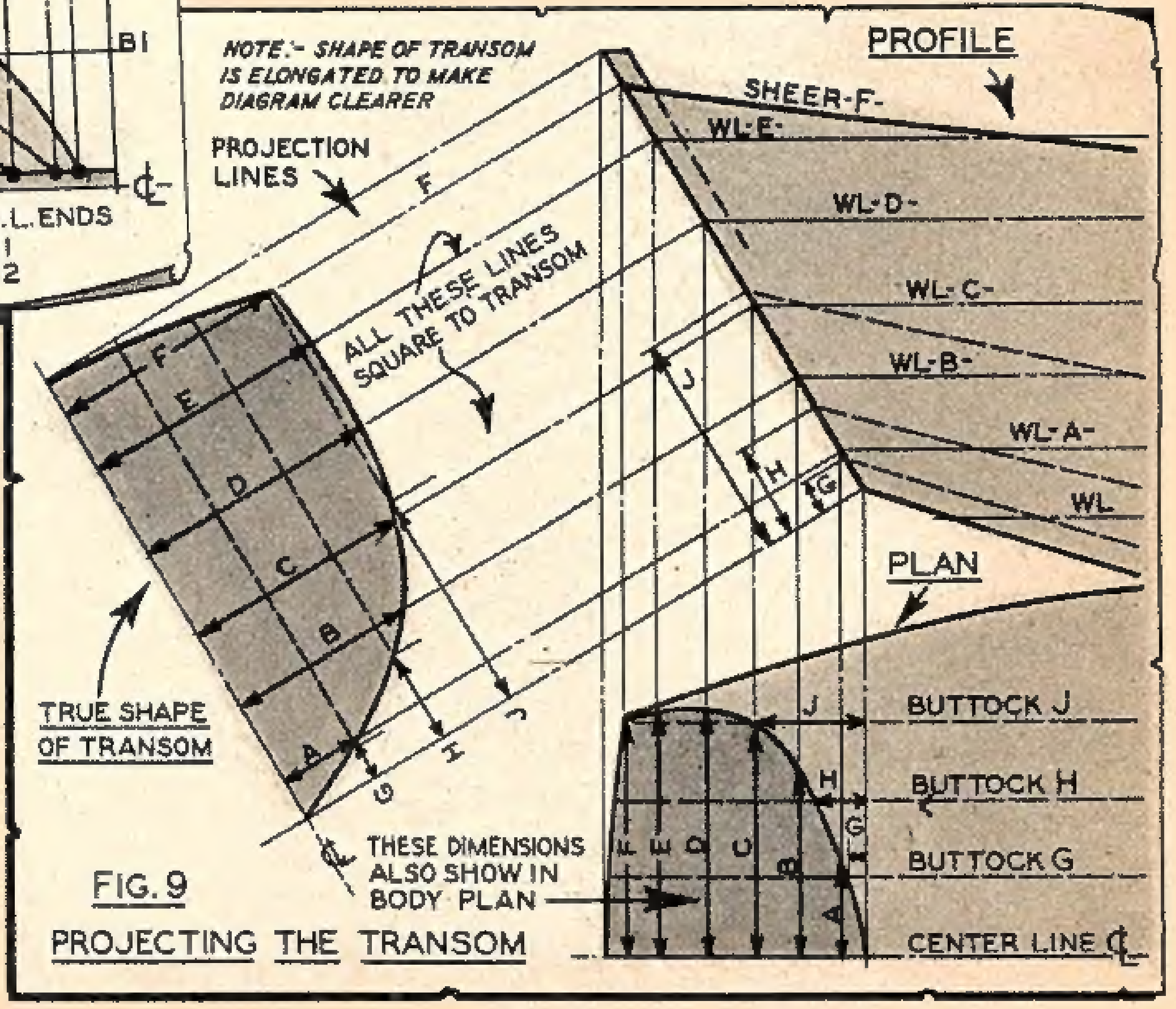

NOTE:- SHAPE OF TRANSOM IS ELONGATED TO MAKE DIAGRAM CLEARER
PROFILE
SHEER-F-
WL-E-
PROJECTION LINES
F
WL-D-
ALL THESE LINES SQUARE TO TRANSOM
WL-C-
WL-B-
WL-A-
WL
J
H
G
F
E
D
C
B
A
J
H
G
℄
TRUE SHAPE OF TRANSOM
PLAN
BUTTOCK J
BUTTOCK H
BUTTOCK G
CENTER LINE ℄
THESE DIMENSIONS ALSO SHOW IN BODY PLAN

FIG. 9 PROJECTING THE TRANSOM

BOAT-BUILDER'S DICTIONARY

LINES—set of curves giving shape of boat.
PROFILE—view looking at side of boat.
PLAN—view looking at bottom of boat.
BODY PLAN—view looking at end of boat.
BASE LINE—arbitrary height reference line.
CENTER LINE—reference line for widths.
BUTTOCK—line through hull formed by vertical slice parallel to center-line.
WATERLINE—line through hull formed by horizontal slice parallel to reference line.
OFFSET—distance from either reference line.
BATTEN—wood stick used to draw curves.
TRANSOM—stern end of boat (usually flat).
SPILING—transferring planking curves.
STEM—curved frame piece at bow of boat.
SHEER—highest line on profile.
CHINE—intersection of sides with bottom.

Keel and Stem of Boat May Be Accurately Laid Out from Large Plans

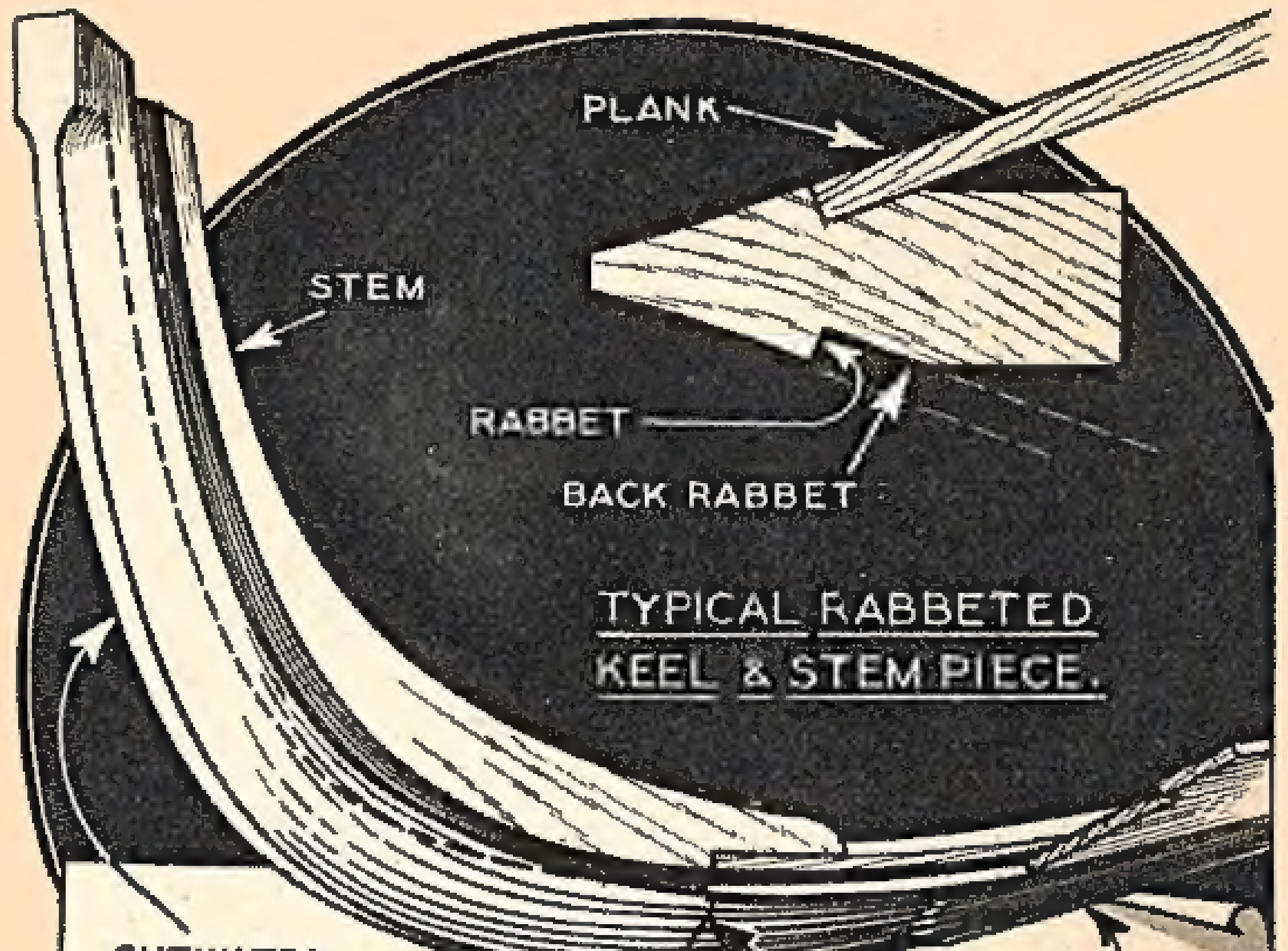
The foregoing rule applies to boats with full curved sections, shown in Figures 1 to 4. The "V" bottom boat presents a slightly different problem but the lines are much more simple. An examination of Fig. 5 will serve to explain them. Fig. 6 shows how measurements are taken on the curved frame "V" bottom craft.

The architect in making the lines plan of a wooden boat always works to the outside of the planking. This should be the rule unless it is positively stated on the plan that the lines are to the inside of the planking. In drawing the plan the architect uses a predetermined scale; usually 3/4" or 1" represents 1 ft. on the actual job.

To give measurements on the lines the architect either furnishes a table of offsets or gives the measurements directly on the plan. An *offset* is either the distance a certain point is from the centerline in case of widths, or above the base line in case of heights. Vertical offsets are sometimes taken above and below the load waterline. Offsets are also given along diagonals.

Almost invariably offsets are given in feet, inches, and eighths. Thus 3-7-5 when translated will mean three feet, seven inches and five eighths, or 3′-7⅝″. A rule to remember in reading offsets is that half widths are given out from the centerline, and heights are given with reference to the base line or load water line.

[Continued on page 118]


PLANK
STEM
RABBET
BACK RABBET

TYPICAL RABBETED KEEL & STEM PIECE.

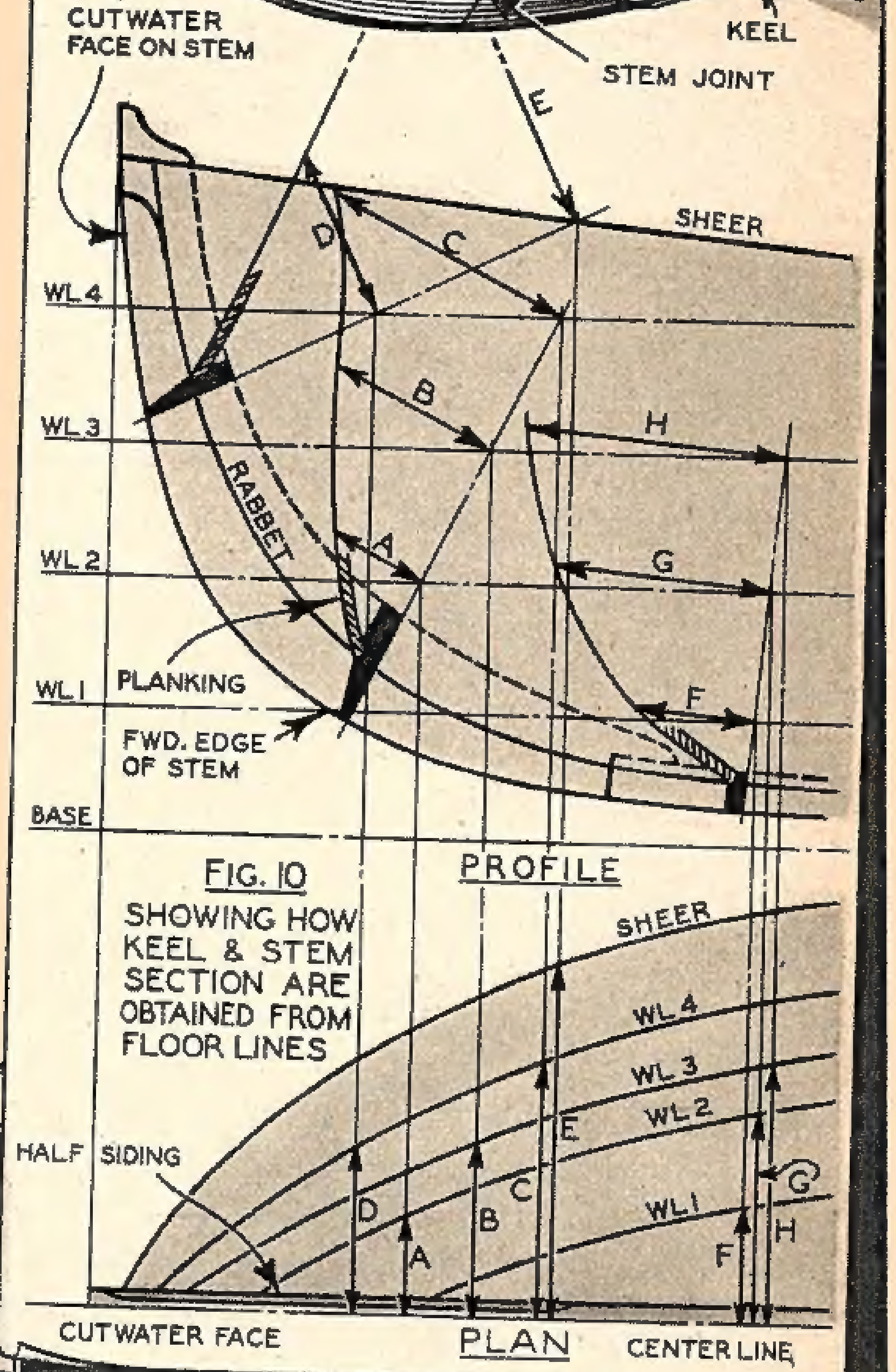
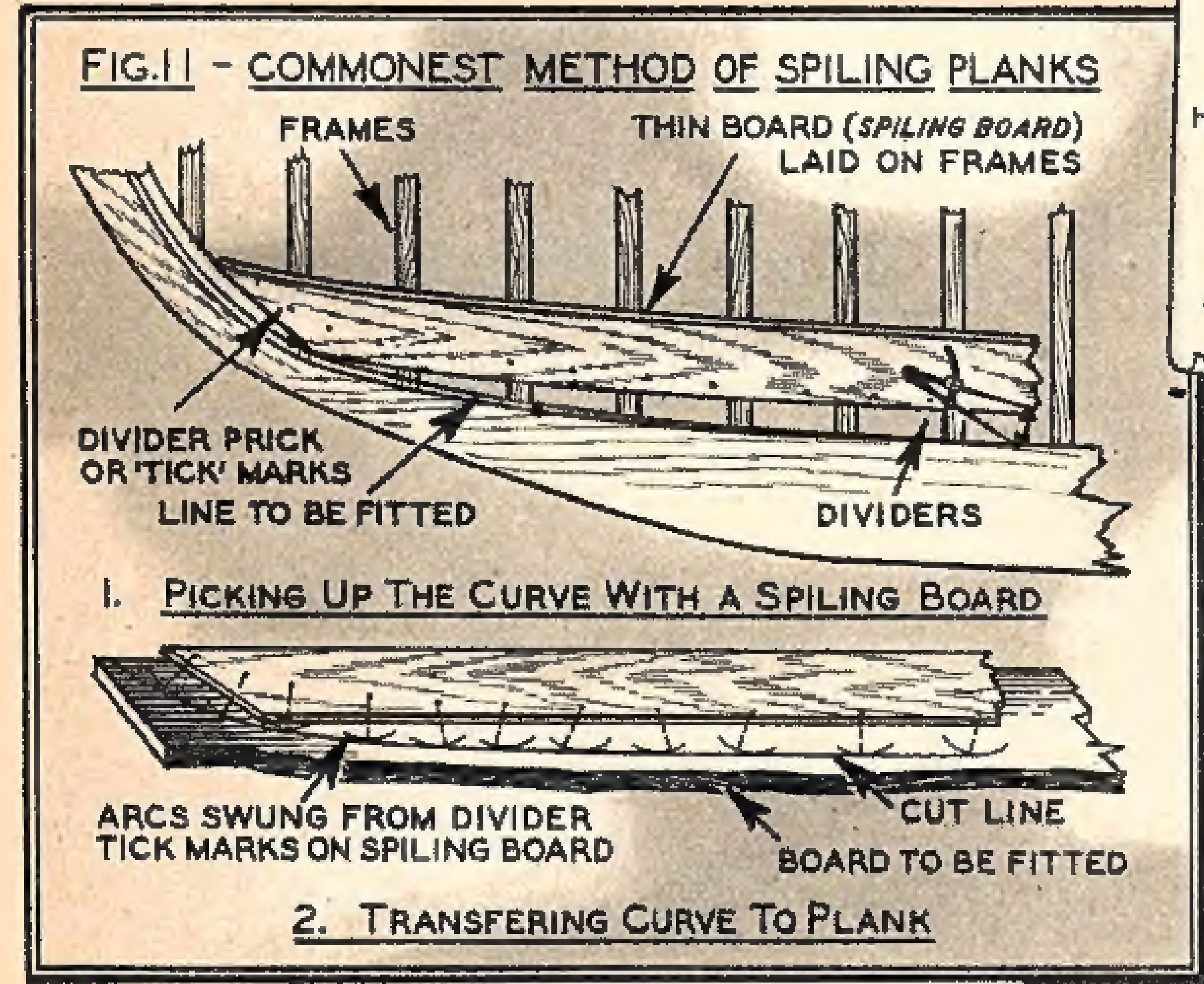

CUTWATER FACE ON STEM
KEEL
STEM JOINT
E
SHEER
WL 4
D
C
WL 3
B
H
RABBET
WL 2
A
G
WL 1
PLANKING
FWD. EDGE OF STEM
F
BASE
PROFILE
SHEER
WL 4
WL 3
WL 2
HALF SIDING
E
D
C
B
A
WL 1
F
G
H
CUTWATER FACE
PLAN
CENTER LINE

FIG. 10 SHOWING HOW KEEL & STEM SECTION ARE OBTAINED FROM FLOOR LINES

FIG. 11 - COMMONEST METHOD OF SPILING PLANKS


FRAMES
THIN BOARD (SPILING BOARD) LAID ON FRAMES
DIVIDER PRICK OR 'TICK' MARKS
LINE TO BE FITTED
DIVIDERS
ARCS SWUNG FROM DIVIDER TICK MARKS ON SPILING BOARD
CUT LINE
BOARD TO BE FITTED

1. Picking Up The Curve With A Spiling Board

2. Transfering Curve To Plank

Method of transferring curves from partly finished boat to next piece of planking is indicated above. Planks should fit perfectly without need for excessive forcing into position. Keep dividers at right angles to plank already on boat to get the correct distance.

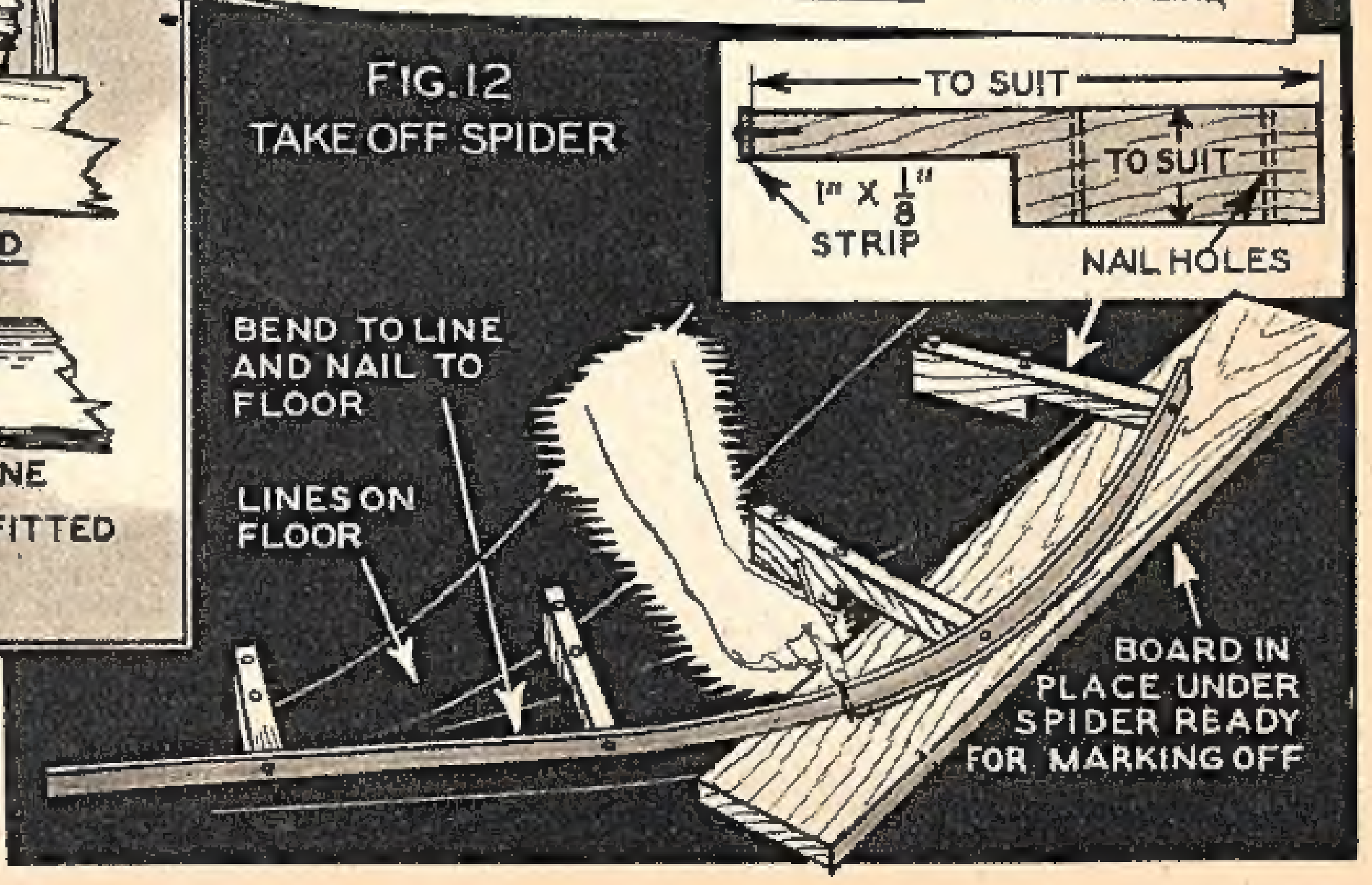
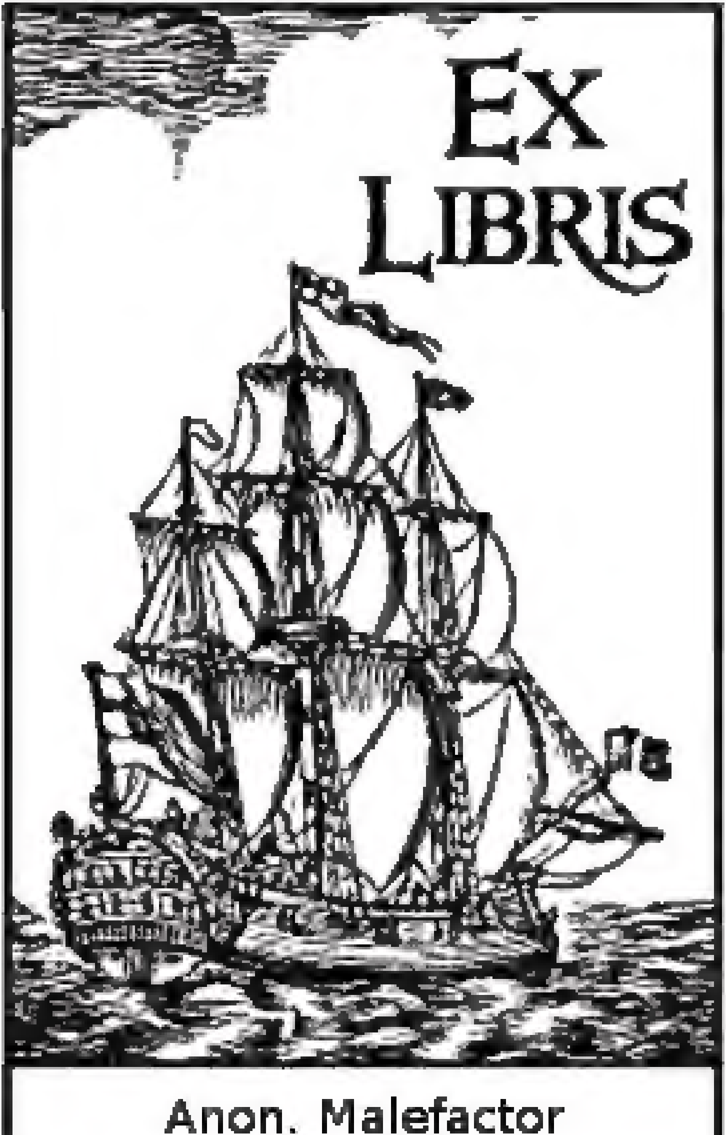

TO SUIT
TO SUIT
1" x 1/8" STRIP
NAIL HOLES
BEND TO LINE AND NAIL TO FLOOR
LINES ON FLOOR
BOARD IN PLACE UNDER SPIDER READY FOR MARKING OFF

FIG. 12 TAKE OFF SPIDER



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